AFRL-IF-WP-TR-1999-1528

RAPID AVIONICS TEST MODIFICATION CAPABILITY

JOHN E. GUILIANO

TASC, INC.
2555 UNIVERSITY BLVD.
FAIRBORN, OH 45324

OCTOBER 1999

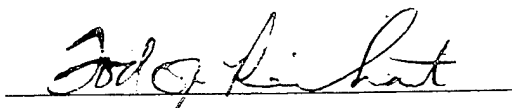**FINAL REPORT FOR PERIOD 04 JANUARY 1996 – 04 JANUARY 1999**

20010824 011

INFORMATION DIRECTORATE
AIR FORCE RESEARCH LABORATORY
AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OH 45433-7334

NOTICE

USING GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA INCLUDED IN THIS DOCUMENT FOR ANY PURPOSE OTHER THAN GOVERNMENT PROCUREMENT DOES NOT IN ANY WAY OBLIGATE THE US GOVERNMENT. THE FACT THAT THE GOVERNMENT FORMULATED OR SUPPLIED THE DRAWINGS, SPECIFICATIONS, OR OTHER DATA DOES NOT LICENSE THE HOLDER OR ANY OTHER PERSON OR CORPORATION; OR CONVEY ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY RELATE TO THEM.

THIS REPORT IS RELEASABLE TO THE NATIONAL TECHNICAL INFORMATION SERVICE (NTIS). AT NTIS, IT WILL BE AVAILABLE TO THE GENERAL PUBLIC, INCLUDING FOREIGN NATIONS.

THIS TECHNICAL REPORT HAS BEEN REVIEWED AND IS APPROVED FOR PUBLICATION.

TOD J. REINHART, Project Engineer
Embedded Information Systems Engineering Branch
AFRL/IFTA

KENNETH LITTLEJOHN, Team Leader
Embedded Information Systems Engineering Branch
AFRL/IFTA

JAMES S. WILLIAMSON, Chief
Embedded Information Systems Engineering Branch
AFRL/IFTA

Do not return copies of this report unless contractual obligations or notice on a specific document requires its return.

REPORT DOCUMENTATION PAGE

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE OCTOBER 1999	3. REPORT TYPE AND DATES COVERED Final, 01/04/1996 – 01/04/1999	
4. TITLE AND SUBTITLE RAPID AVIONICS TEST MODIFICATION CAPABILITY			**5. FUNDING NUMBERS** C: F33615-92-D-1052 PE: 69199 PN: OAFI TN: FT WU: 02
6. AUTHOR(S) JOHN E. GUILIANO			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) TASC, INC. 2555 UNIVERSITY BLVD. FAIRBORN, OH 45324			**8. PERFORMING ORGANIZATION REPORT NUMBER** PR-8290-FINAL
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) INFORMATION DIRECTORATE AIR FORCE RESEARCH LABORATORY AIR FORCE MATERIEL COMMAND WRIGHT-PATTERSON AIR FORCE BASE, OH 45433-7334 POC: Tod Reinhart, AFRL/IFTA, (937) 255-6548 x3582			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER** AFRL-IF-WP-TR-1999-1528

11. SUPPLEMENTARY NOTES:

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited.	12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 Words)

This effort involves the research of identifying the Special Operation Forces (SOF) software/system support capabilities and requirements for the future support of SOF weapon systems. In addition, the development of a RATEMC Software Support and Test Program Set (TPS) development plan which provides a cost-effective approach for I-level maintenance for the SOF.

14. SUBJECT TERMS Software Support, Test Program Set, Special Operation Forces I-level maintenance			15. NUMBER OF PAGES 70
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** SAR

TABLE OF CONTENTS

iii

1. INTRODUCTION

TASC completed its work on test program set development, automatic test equipment, field maturation testing, sustaining engineering, program support, and special studies for Special Operations Forces (SOF) requirements for intermediate and depot level maintenance support to the AC-130U, AC-130H, MC-130H, MH-53J, MH-60K, and CV-22 aircraft. Support was provided to the Integrated Product Development Teams as required for Automatic Test Equipment (ATE) and Test Program Sets (TPSs) development, testing, and sustaining engineering support. TASC provided primary support to the Integration Program Office (ASC/LUN) and secondary support to Combat Talon II, MC-130H (ASC/LUM), Gunship, AC-130U (ASC/LUU), and Helicopter/CV-22 (ASC/LUH) Program Offices.

1.1   BACKGROUND

Special Operations Forces weapon systems are constantly undergoing revisions due to rapidly changing mission requirements and availability of new technologies to maintain system superiority. The rapid changes to the weapon systems and the operational requirements to make changes and support the new systems in the field severely tax the capabilities of traditional depot, intermediate, or organizational level Test Program Set (TPS) support assets for SOF. Research and development of new technology is required to leverage or enhance the TPS development capabilities of traditional standard test sets to meet the SOF needs for rapid TPS maintenance.

1.2   OBJECTIVE

The objective of the effort is to support the government in implementing a Rapid Avionics Test Modification Capability. These tasks are required to support avionics platform Program Managers (PM) with unique frequently changing avionics testing requirements.

2. WORK PERFORMED

2.1 AN/ALQ-184 ELECTRONIC COUNTERMEASURES (ECM) POD CABLE TEST

Purpose — The Technical Information Memorandum (TIM) documented the development effort, development environment, and tool used to create the ALQ-184 electronic countermeasures (ECM) pod phase matched cable test capability for WR-ALC. This TIM describes the test interfaces and the interactions required by the test operator to perform calibration and test activities. These include: references to the power-up and power-down procedures for the host test station, pre-test calibration activities, calibration validation procedures, cable testing by selected part number, and printing and storing of cable test results. See Appendix A for further information about this TIM.

2.2 RADIO FREQUENCY MOBILE ELECTRONIC TEST SET (RFMETS)/DOWN SIZE TESTER (DST) COST/BENEFIT ANALYSIS (CBA) AUTOMATIC TEST STATION COMPARISON STUDY

Purpose — The CBA was designed to aid in determining if United States Special Operations Command (USSOCOM) should continue to use the Radio Frequency Mobile Electronic Test Set (RFMETS) as the common deployable intermediate level avionics tester or if the proposed F-15 Down Sized Tester (DST) should replace the RFMETS.

Scope — The study was limited to a CBA of the RFMETS and the DST because these were the only candidate test systems that could meet Special Operations Forces (SOF) requirements.

Introduction — The study compared the use of the DST and the RFMETS in fulfilling the Air Force Special Operations Command (AFSOC) intermediate level avionics maintenance requirements. To assure that the CBA remained unbiased, actual data was used when available. Assumptions and statements of fact were reviewed and agreed to prior to the analysis. The measures of effectiveness included DoD acquision, operation and support costs, ability to meet AFSOC workload demands, test system availability schedules, and SOF deployability needs. The most representative common set of units under test (UUTs) was selected from among existing avionics subsystems that both test sets were supporting or that they have been designed to

support. Actual information for each of the subsystems was used where available. An agreed upon model and factors were used to consolidate measures of effectiveness for each of the testers when actual information did not exist.

Methodology

Requirement Definition — During this phase, the comparison groundrules and assumptions were established. The objective was to conduct an unbiased comparison of the RFMETS and the DST by evaluating each of the test systems ability to test a common selection of LRUs. A common or derivative avionics subsystem that both test systems had been designed to support is the common LRUs of the APG-70 and APQ-180 radars. These radar subsystems offered an opportunity to exercise a large portion of the capabilities of each of the test systems using common test requirements. The DST is designed to support the APG-70 radar subsystem and the RFMETS supports the APQ-180 radar subsystem. Since the APQ-180 radar is used on the AC-130U aircraft and is a derivative of the APG-70 radar used on the F-15 weapon system, there are similarities in test requirements. Differences in test requirements between the two radar subsystems were noted and the impact of the differences highlighted. Using a single major subsystem as the basis of comparison was expected to yield a cost-effective result in a realistic timeframe. Other avionics subsystems that may have test requirements in common between the test systems were considered for incorporation in the comparison. A listing of all subsystems supported by each test system was provided to show the range and variety of the avionics subsystems supported.

Data Gathering — Data for each of the test systems was gathered to satisfy the comparison requirements. The complete list of avionics LRUs tested by each of the testers was collected for comparison (atch.1). The operational/deployment impact of each of the test systems was determined. The comparison of the selected LRU Test Program Sets (TPSs) was done in detail and included the setup and run time requirements, transportation and deployment footprint, size and weight, recurring and non-recurring cost and schedules, deployed operational requirements, and the test coverage for each of the LRUs.

Data Evaluation — The data collected for each test system was provided as information to the USSOCOM, AFSOC, San Antonio Air Logistic Center, DST and RFMETS Program

3

Offices. The DST and RFMETS data was validated by the DST and RFMETS Program Offices respectively to assure that it was complete and would contribute to an unbiased comparison.

Analysis — Actual data for each test system was used in the analysis. Differences in the data were evaluated and modeling was used where no actual data was available. The operation and support costs were evaluated using the Joint Advanced Strike Technology (JAST) Operating and Support Technology Evaluation (JOSTE) model. JOSTE is the latest evolution of the TASC family of LCC models that use the same computation algorithms as life cycle cost analyzer (LCCA) and standardization evaluation program (STEP). JOSTE was proposed for use in this study because it offers a flexible means of evaluating alternatives for life cycle cost impacts using a readily available personal computer (PC) environment. The JOSTE model is a Microsoft Windows hosted, PC based operating and supports cost and technology assessment program.

Study Recommendation — The analysis/study findings showed that the most cost effective test system to support the continued and new SOF requirements was the RFMETS based on the JOSTE model analysis. The rehost/development costs of TPSs to a new tester was cost prohibitive and the support structure in place could easily be expanded versus establishing a new support structure.

2.3   CV-22 SUPPORTABILITY STUDY

Purpose — The purpose of this study was to understand and analyze the common and unique maintenance requirements of the V-22, CV-22, and the MV-22 weapon systems. Particular emphasis was placed on understanding the needs and requirements of the Special Operations Forces (SOF) as the CV-22 weapon system is deployed.

Scope — The V-22 development program is managed by the Naval Air Systems Command at Crystal City, while the SOF peculiar equipment is funded by the Air Force through the Air Force Special Operations Command (AFSOC), Hurlburt Field, Florida. The study included the available CV-22 avionics suite information in a database used to develop input files for alternative cost analysis using the JAST Operating and Support Technology Model (JOSTE), a Life Cycle Cost (LCC) model developed by TASC for the Joint Advanced Strike Technology Program.

Methodology — The study began with a review of the available documentation describing the requirements for the V-22 weapon system and the specific requirements for the CV-22 weapon system built to comply with the needs of the SOF community. Discussions were held with Program Office personnel at Crystal City to gain a clearer understanding of the avionics requirements described in the Operational Requirements Document for the weapon system. An information-gathering trip was made to Hurlburt Field, Florida to gain further insight into the avionics needs in the SOF environment. The avionics subsystem descriptions were compiled in a database used for entry into the JOSTE Model. The information was then used for what-if analyses of alternative support techniques and avionics configurations.

Study Assumptions/Guidelines — The Engineering, Manufacturing, and Development (EMD) phase of the V-22 is funded by the Navy, while production funding of the common MV-22 features will be assumed by the Air Force and funding for the unique hardware in the CV-22 will be assumed by the US Special Operations Command (USSOCOM).

Analysis Concept — JOSTE has been employed in this study because it offers a flexible means of evaluating alternatives for life cycle cost impacts using a readily available personal computer (PC) environment. The JOSTE model is a Microsoft Windows hosted, PC based operating and supports cost and technology assessment program. It was developed to evaluate the combined cost of acquiring and supporting next generation avionics systems. It assesses the costs associated with the supportability and sustainability of systems over their operational life. Cost comparisons can facilitate selection of avionics alternatives at the system and the subsystem levels. The model will also support technology cost forecasting using technology maturity levels and technology scaling factors. Since avionics alternative evaluations will be needed over an on-going basis in the future, the data was structured to permit the analyst to rapidly re-configure the model to run the analysis. The data has been compiled and maintained in a FileMaker Pro database designed to be readily expanded as data becomes available or changes as the program matures.

Study Recommendation — The study showed that the CV-22 aircraft possessed systems that could be supported with the METS/RFMETS automatic test stations. Existing TPSs could be

modified to provide the additional repair capability for common systems, while new TPSs would have to be developed for CV-22 SOF unique systems.

2.4 CALIBRATION AND MEASUREMENT REQUIREMENTS SUMMARY STUDY

Background — The Calibration and Measurement Requirements Summary (CMRS) is a three-category, contractor prepared summary of measurement parameters. The CMRS identifies all measurement requirements within a specific system or item of equipment (including Support equipment (SE) items) which must be measured or tested to ensure the system's operation is maintained within its specified limits. The CMRS further indicates the contractors proposed solutions to maintain the system parameters within stated limits. These data are provided to the Air Force, ensuring calibration supportability and planning.

The CMRS is made a contract deliverable by referencing the required language in the contract. Calibration is a necessary element of logistics support for Air Force weapon systems, subsystems, and Support Equipment (SE). For adequate calibration support to be available at the time and place it is needed, it must be considered early in the Acquisition process. Measurement parameters of new systems and equipment can generate requirements for Air Force or national standards. Developing such standards and the means to transfer their value can be a lengthy and costly process.

Acquisition agencies are required to ensure calibration support is considered during the planning for logistics support of their equipment. Most test measurement and diagnostic equipment (TMDE) acquired in support of new systems or subsystems is identified by the contractor through Logistics Support Analysis and CMRS. Because of a lack of funding or oversight during system acquisition, CMRSs are not always developed and/or provided.

Purpose — TASC was asked to investigate/study the possibility of developing software that could be used to develop a CMRS product after a system had already been acquired or to find out if software already existed. TASC approach was first to determine if there were any commercially available tools that would expedite data extract for expediting the manpower intensive task of manually extracting the TYPE I CMRS data and the components needed to develop the TYPE 3 data. TASC and the project officer reviewed two potential tools. The first

was a modified version of Galactic's Test Program Set (TPS) Instrument Command Extraction Tool (TICET). The tool was able to automatically extract absolute values but not tolerance data. Galactic's estimate for modifying their tool to extract variable data was not cost effective for this effort. The second tool reviewed was a GTT's (General Telephone & Telegraph) tool. Their design was sound but it was neither cost nor time effective for this effort. In both cases, neither product could be used to meet the Air Force requirements without major investment of time and money. A total development effort was also found not to be cost effective, compared to original cost estimates provided by the system developers. Another option that was looked at was extracting the data from electronic files using a database and associated software which could be developed within the cost and time constraints of this study. The program office provided all available files to TASC for review and started development of the database prototype. This process included a three-week effort to determine what portions of the effort could be hosted in MS Access database and what portions could not. The design and building of the database prototypes for this effort were completed. Review of the available MS Access functions revealed that it would be more cost effective to use MS Basic program because of the repetitive, multiple database quires, extraction, and mathematical operations required. During an interim briefing, government personnel directed that no further effort should be expended on the investigation/study, as no possible alternatives would be cost effective. In addition, much of the data required for generation of a CMRS was proprietary or not purchased during the acquisition phase of the program.

2.5 AIRCRAFT MODERNIZATION PROGRAM (AMP)/COMMON AVIONICS ARCHITECTURE FOR PENETRATION (CAAP) ACQUISITION STRATEGY

Introduction — This tasking was concerned with defining a roadmap of activities that were required in order to arrive at a Milestone I decision for CAAP. Other tasking covered an independent assessment of the CAAP Acquisition Strategy. As a result of activities occurring at high levels in the Air Force and DoD the possibility of the Avionics Modernization Program (AMP) and CAAP being conducted together and at Wright-Patterson AFB surfaced. New tasking provided by ASC/LUN consisted of assessing the effort already being done on AMP and the acquisition strategy to be pursued by the AMP/CAAP combination. A particular activity covered during the tasking consisted of reviewing the CAAP Conceptual Design developed by

ASC/LUN. The Integrated Weapon System Support Program (IWSSP) contract awarded by ASC/LU was made to the Boeing Company with a support approach to build on the successful ongoing AC-130U Interim Contractor Support (ICS) organization by adding team members from industry and government. The industry team mates include: TRW, Manufacturing Technologies Inc., Ball Aerospace, MacAuley Brown, California Microwave Inc., Systems & Electronics, Inc., and Crestview Aerospace Corporation. Also, a business understanding has been signed with Warner Robins Air Logistics Center that provides Boeing-Air Force software systematic development (LY), C-130 core competencies partnering (LB), and defensive avionics integration support (LN). The understanding with WR-ALC also provides for cooperative usage of the Air Force Special Operations Forces Extendable Integrated Support Environment (EISE) facility at WR-ALC and the Boeing Software Integration Laboratory (SIL) at Fort Walton Beach, Florida. This contract will be used to support all SOF sustainment requirements.

Assessment of CAAP Acquisition Strategy — A roadmap of the activities defining an Acquisition Strategy for the CAAP program was under development during the time of this tasking. Due to the activities of higher authorities, discussed above, the CAAP acquisition was never completed. As a result of this effort, some useful ideas were developed which are discussed in subsequent sub-paragraphs.

Conceptual Design — A draft copy of the CAAP Conceptual Design developed by ASC/LUN team was reviewed during this period. The design was not reviewed in detail but several observations were noted. Overall the effort appears to be a sound technical treatment of integration of CAAP on SOF aircraft. There were portions that were not complete at the time of its review.

The material on the C-130U was incomplete and needs further effort. It was interesting to note that the C-130U does not consider the integration of the Low Probability of Intercept TF/TA. This was because the USSOCOM ORD does not list the TF/TA as a threshold requirement, only as an objective requirement for the C-130U. It would seem that this should be a threshold requirement on all SOF aircraft. It is suggested that this be considered in follow-on activities.

During this design investigation, the replacement of the AP-102A was not investigated. This processor has marginal growth capability and will become a key factor in any integration of AMP/CAAP capability on SOF aircraft. The most challenging replacement of the AP-102A will be on the AC-130U. This replacement leads to the question of how do you develop software to work on the new processor(s) and maintain all the current capability? The use of an Open System Architecture has been proposed but it is not clear from material reviewed as what programs have any experience in this area. The concept seems worthy of pursuit but this area needs to be considered high risk.

The CAAP Conceptual Design needs to be continued with the goal of developing a set of well-defined requirements, which can be used in either a combined AMP/CAAP program or a CAAP program alone. The surest and quickest way to create problems in any program is to start with poorly defined requirements and continue to make changes in requirements during development. ASC/LUN has a plan for the follow on effort and this should be pursued with the intent of establishing well defined requirements, replacement of the AP-102A, and identification of all interfaces with the AMP program. In addition, a through Risk Management analysis needs to be applied to this task.

Handbook Development — Using the material contained in the Defense Acquisition Deskbook (DAD) Version 2.4, a handbook for Risk Management and Acquisition Strategy were developed. These handbooks contain information from the DAD containing topical descriptions, procedures, mandatory and discretionary references, applicable training courses and discretionary practices in DoD and the Air Force. Each handbook has a table of contents indicating the topics covered in each section. In addition to the Risk Management and Acquisition Strategy volume, there is a volume, which contains DoDD 5000.1, and DoDD 5000.2-R. A large amount of the regulatory requirements pertaining to the acquisition process is contained in these two DoD Directives.

To indicate how the handbook can be used, an example follows. In the Table of Contents of Part I of the "ACQUISITION STRATEGY" volume under Tab 1 can be found the topic "Process Information." The following information is found under this tab: An outline, which establishes a general model for managing a Major Defense Acquisition Program (MDAP); a

listing of recommended Program Management Courses; Mandatory references dealing with the acquisition process, discretionary references, which can be accessed from the computer exactly just like the mandatory references; and a discussion of the "General Acquisition Process."

The reason that the "Process Information" topic was selected as an example was to point out information contained in the article "General Acquisition Process." In this article, a table titled "Program Documentation for Milestone Reviews" lists the mandatory documentation required at each milestone review, source of the requirements (Statutory or Regulatory), who prepares the document, who approves/considers the document, and if the document has a mandatory format. This table is invaluable in the preparation of any acquisition strategy program and its required documentation.

Efforts are underway to see that all ASC/LUN personnel have accessed to the latest version of the DAD through their computers. If this is successful, then the information contained in the handbooks can be access directly through the computer and displayed on the monitor. Members of ASC/LUN will have the option to find information either by reading the handbook or viewing the material on the monitor.

Training — ASC/SYG PreAward Support Office (PASO) is an office at Wright-Patterson, with a multi-functional team of government and contractor personnel, dedicated to assisting ASC acquisition teams through the preaward process (Acquisition Strategy, Request for Proposal (RFP) Development and Source Selection). Training is offered by the PASO and it is tailored to the specific needs of each program team. The Acquisition Strategy Process Training consists of courses such as; An Overview of the Preaward Process, Statement of Objectives (SOO) Overview, Acquisition Strategy Planning Process, Test and Evaluation in the Preaward Process, Source Selection Planning Overview, and Cost as an Independent Variable (CAIV). In addition, they offer Competitive Program Workshops and Request for Proposal Training. One of the more important Workshops is the Initial Program Risk Assessment Workshop. The documents developed during this workshop are the Initial Draft Statement of Objectives, Evaluation Criteria Outline, and Instructions to Offerors, Outline and Program Risk Matrix. A course syllabus is located in the "ACQUISITION STRATEGY" Part II handbook.

Contact with the PASO office needs to occur as soon as the AMP/CAAP programs are assigned to ASC and the Working Level Integrated Product Team (WIPT) has been selected. The WIPT should be scheduled for all the Acquisition Strategy Process Training, Competitive Program Workshops, and Request for Proposal Training. The training should start as early as possible so that it is not delayed by the magnitude of the workload limiting the availability of team members. Contacts in the PASO office are Lt. Col. Kevin Rankin (937) 255-2763 and Mr. Robert Andrews (937) 255-2763. Mr. Andrews is the ASC/LU point of contact in PASO.

The PASO has developed a generic schedule program for both competitive and sole source procurements. These schedules run on Microsoft Project 4.0 and can be used, as a model by the acquisition team, in planning the activity needed to get to a given Milestone. The team can add or delete activities and change the amount of time to accomplish an activity based on the characteristic of the particular program. All the statutory and regulatory activities are included in the generic schedule. The program should be aware that the PASO is required at ASC to approve the RFP before it can be released to industry.

2.6 PROGRAM SUPPORT

Primary program support was provided to the Integration Program Office ASC/LUN in support to the following programs: Mobile Electronic Test Set (METS) and Radio Frequency Mobile Electronic Test Set (RFMETS) intermediate/depot level tester acquisition and modification programs, along with the acquisition of three additional RF sections. The Aircraft Radar Avionics Test Station (ARATS) intermediate level tester acquisition, Test Program Set (TPS) development involving several developers (Lockheed Martin Federal Systems, Systems and Electronics, Inc., TAMSCO, and DME Corp.). In addition, the AP-102A Mission Computer Depot repairs acquisition, MC-130H aircraft APQ-170 radar modification to the -423E/425 configurations, and the APQ-170 radar depot repair acquisition.

The intermediate level maintenance capability is comprised of the ARATS APQ-170 radar hot mock-up, METS and RFMETS test sets, Test Program Sets (consisting of Test Programs, Interface Test Adapters, and engineering/technical data) for selected groups of LRUs, ancillary equipment to augment test set capabilities, and engineering/technical data. The Intermediate-level (I-level) capability detects failures of the LRUs, isolates them to failed Shop

Replaceable Units (SRU), removes and replaces the failed SRU, and certifies the operational suitable of the LRU. The I-level capability supports LRUs from the AC-130U Gunship All Light Level Television (ALLTV), APQ-180 radar, displays, weapons control systems, and AIC-40 communications system; AC-130H, AIC-38 communications, displays, and weapons control systems; and the MC-130H APQ-170 radar system. The I-level capability is a mobile and, except for the ARTS, deployable on two pallets on support aircraft. While deployed, it operates in a double-wide NAVAIR shelter.

The Depot-level capability consists of TPSs, ancillary equipment, tools, and engineering/technical data foe use with several existing depot test sets at WR-ALC along with software maintenance capabilities. The depot capability maintains selected SRUs and some LRUs that cannot be repaired in the field. The depot includes a set of the I-level capabilities. The depot capability detects failures in SRUs, isolates the failed components, removes and replaces the failed components, and certifies operational suitability of the SRU. The depot supports the majority of the systems identified at the I-level. The Automatic Test Equipment will be managed by SA-ALC and the aircraft UUTs will be managed by WR-ALC.

One of the major development effects accomplished for support to ASC/LUN was the identification of all LRUs and SRUs being supported by the METS/RFMETS testers. This was accomplished by developing and maintaining a database that tracked all required information and part number rolls. This Excel spreadsheet example (Attachment 1) was developed/maintained by TASC and used by the MAJCOM, Program Offices, and supporting Air Logistics Centers to insure total subsystem support. In addition, a scheduling notebook (Attachment 2) was developed/maintained showing all the subsystems being supported, Government Furnished Equipment requirements, status, and location. The notebook also included schedules for each system being supported, funding information, listing of key personnel and other information required for successful completion of the program. This notebook became a value asset and key management tool for the program and over 80 individuals on distribution. TASC performed trade-off analysis, schedule analysis, and recommendations on contractor submitted schedules and prepared briefings as required.

Another area that was constantly under evaluation was that of rehosting the METS/RFMETS TPSs to other candidate automatic test stations. In fact, a separate study was conducted against the F-15 Down Size Tester as explained earlier in this report. In all cases, the rehosting of TPSs was too costly, as no software existed that would allow the conversion in a cost-effective manner, thus requiring full TPS development.

These are only some of the major areas that were supported by TASC during the period covered by this contract. This report can not be totally inclusive but provides the most important areas of study or support to ASC/LU.

3. CONCLUSION

During the period of this delivery order, many of the specific tasks and the extent of the support required was to implement a capability to baseline the many different development programs required to support the Special Operation Forces intermediate and depot level avionics testing requirements. Once this was accomplished, much of the effort was concentrated on supporting studies as outlined in the Statement of Work (SOW) paragraphs 3.1.1 through 3.1.4 and direct program management support.

The studies and support provided by this delivery order allowed ASC/LUN to accomplish the critical tasks necessary to support their customer in a timely and cost efficient manner. TASC helped solve many of the day-to-day and long-term problems facing ACS/LUN by recommending alternative solutions; identifying potential problem areas while providing recommended solutions, providing experience in program management, operations, and support cost benefit analysis; and providing comparison studies.

APPENDIX A
TECHNICAL INFORMATION MEMORANDUM

Litton
TASC

Technical
Information
Memorandum

Litton
TASC

To:		*TIM No.*	
Commander Warner Robins Air Logistics Center Robins AFB, GA 31098 Attention: Mr. Mark Leslein		*Date:* June 1998	
		Contract No. F33615 -92-D- 1052	
		From: Michael H. Nichols	
Program: Rapid Avionics Test Modification Capability (RATEMC)		*Approval:* C.J. Debeljak	
Subject: AN/ALQ-184 ELECTRONIC COUNTERMEASURES (ECM) POD CABLE TEST			

ABSTRACT

This Technical Information Memorandum (TIM) documents the development effort, development environment, and tools used to create the ALQ-184 electronic countermeasures (ECM) pod phase matched cable test capability for WR-ALC/LNXEJ. This capability was developed under the Rapid Avionics Test Modification Capability (RATEMC) deliver order of the Avionics Software Technology Support (ASTS) contract (F33615-92-D-1052) with Wright Laboratories Hardware and Software division. Additionally, this TIM describes the test interfaces and the interactions required by the test operator to perform calibration and test activities. These include: references to the power-up and power-down procedures for the host test station, pre-test calibration activities, calibration validation procedure, cable testing by selected part number, and printing and storing of cable test results.

Litton
TASC

Table of Contents

1. BACKGROUND

The modification of test specifications or the addition of new test requirements into an existing automated test system (ATS) requires a software development effort that is time consuming and expensive. TASC developed re-configurable software during the Traveling Wave Tube (TWT) Automated Test Station (TATS II) Version II development program for WR-ALC/LN. This software suite, the Microwave Component Analysis and Test Software (MiCATS™), includes several tools that enable rapid modification of the software and the data files used to define the operation of the software. Combined with a robust set of test editors, MiCATS™ enables the software maintainer to rapidly prototype new test and measurement capabilities. Utilizing generalized test algorithms as templates for developing new tests or the editors to modify or create new test requirements, WR-ALC/LN selected the MiCATS™ as the development system of choice to acquire a test capability for the ALQ-184 ECM Pod phased-matched cables.

2. SCOPE

WR-ALC/LN needed the ALQ-184 ECM pod phased-matched cable test capability developed rapidly to meet program milestones and desired a cost-effective solution that would also provide growth for future requirements. This test capability included Voltage Standing Wave Ratio (VSWR) testing, insertion loss testing, electrical length or phase testing, and the ability to track phase for sets of cables. TASC was to develop this capability within 30 to 60 days and be able to test several different cable lengths, each with its own VSWR, phase, and insertion loss requirements. Utilizing the MiCATS™ test develop suite, TASC would build prototype tests to meet these requirements by modifying exiting tests and using the editors to create the various test limits files for the cable specifications.

3. DESIGN AND DEVELOPMENT OF CABLE TESTS

Using specification data provided by WR-ALC/LN in the Times Microwave Systems Acceptance Test Plan (ATP) for cable assemblies, manufactured by Times Microwave Systems per Raytheon drawing 1038372 and 1038373, dated 29 March 1996, TASC developed the required tests and associated test limit files using the MiCATS^{TM} development suite. The development effort spanned five weeks and this included software re-configuration, calibration procedures development, test limit files creation, verification and validation, integration testing, sell off to the WR-ALC/LN customer, test of approximately 100 cables, and development of cable test procedures and reports. The process for developing Test Program Sets (TPSs) for the various cables, four different cable types, is delineated in the following paragraphs.

3.1 Software Reconfiguration

While the MiCATS^{TM} development suite included several of the test programs required to support this effort, the VSWR and phase matching programs had to be developed. By utilizing software components within the MiCATS^{TM} development library, TASC was able to prototype these new programs within two weeks. Once they were developed, associated test editors were fabricated using legacy components within the MiCATS^{TM} software assets library. Once the basic programs and editors were developed, the MiCATS^{TM} editing environment was used extensively to create specific TPSs for the various cables. The cable testing required that we have the ability to perform phase, VSWR, and insertion loss testing. To maximize the utility of the test programs and minimize the impact on the TATS II, TASC hosted the entire set of cable tests on the Vector Network Analyzer, which is currently used to test ALQ-184 TWT phase only. Therefore, we gained more utility from this instrument and allowed testing to be conducted on the VNA without interfering with other testing activities, if desired. The four primary tests are discussed in the following paragraphs.

The Voltage Standing Wave Ratio (VSWR) Test performs a forward and reverse measurement of reflected input signal and compares the measured amount to the maximum allowable amount for each cable. Refer to Figure 3-1 for discussions concerning the operation of the VSWR Test.
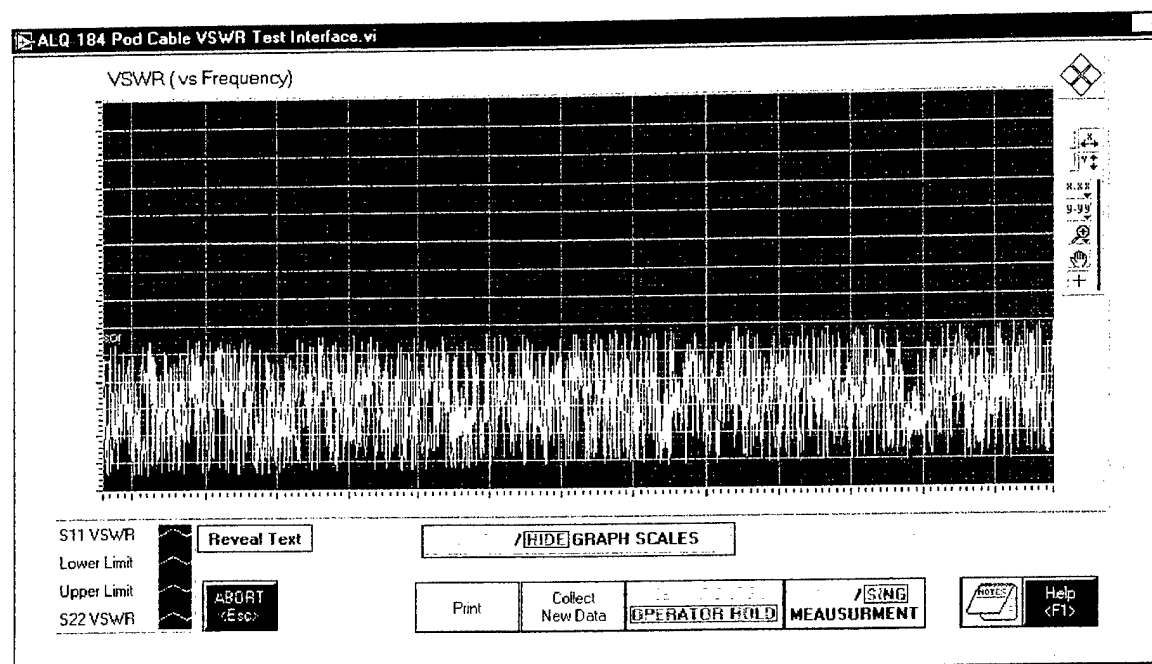
Figure 3-1   VSWR Test Interface

The VSWR Interface Panel has a large graph that depicts the measured forward and reverse VSWR for the cable under test (CUT). The yellow plot represents forward VSWR and the purple plot represents reverse VSWR. The VSWR Interface Panel has several user controls located on it. Since many of these controls are standardized, they will be labeled and function exactly the same on other interface panels. For this reason, they will be discussed once in this section and not repeated in other sections. To the top right side of the graph are the graph controls. These controls are used to manipulate the graph display and include: X and Y manual and auto scale controls, magnifying glass, pointer, and paging (+) capability. The graph legend in the lower left corner provides a color-coded display of the various plots used on the VSWR Graph. Across the bottom of the interface panel are the

test interface operator options. The first is the ABORT option, which activates the global test abort. If in a driven sequence the next test in the sequence will automatically execute. The SHOW/HIDE GRAPH SCALES option allows the operator turn on and off the graph scales for the currently displayed graph. This option is useful if the values for the test are classified. The REVEAL/HIDE TEXT option allows the operator to toggle between a graphical display or a textual-based test report. The PRINT option allows the operator to send the graph of the test results to the default system printer. The COLLECT NEW DATA option allows the operator to force the test to collect new test data. The TEST PROCEED/OPERATOR HOLD option allows the operator to toggle between automatic test proceed after collecting and displaying results or operator hold mode which allows the operator to interact with the test interface panel. The CONT/SING MEASUREMENT option allows the operator to set the test to collect a single set of data (default) or continuously collect and display new data. The NOTES option allows the operator to launch the interactive NOTE TOOL for entering data into test specific, test sequence peculiar, or personal files. The HELP option allows the operator to enable/disable the on-line help capability that explains the various controls and indicators located on the test interface panel. All of these controls are standard controls that appear throughout the interfaces within the ALQ-184 Cable Test software.

The Phase Test measures the electrical length of the CUT and compares it to the expected electrical length and displays the results in phase relative to the desired length. The Phase Test uses the actual electrical length of the individual cables to test each of the cables. Since the electrical length difference desired between the CUT and the electrical length standard is zero, the tolerance is applied around a zero level. Therefore, an upper and lower maximum allowable phase is displayed as solid red lines at the minimum and maximum levels. Reference the Phase Test interface panel during discussions that follow. The graph displays the measured phase value referenced to zero or the desired electrical length. The graph controls are standard and control the display as described in the VSWR Test.

In Figure 3-2, the user controls on the Phase Test Interface Panel are the same as the VSWR test.
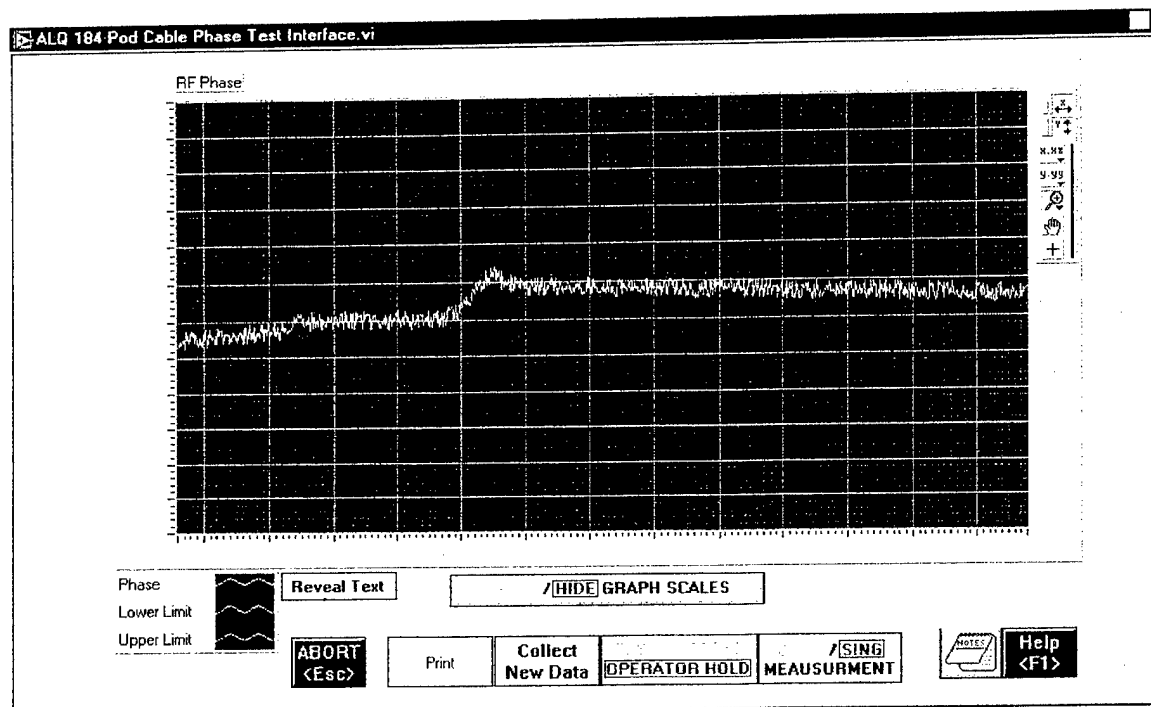
Figure 3-2   Phase Test Interface Panel

The Insertion Loss Test is designed to measure the loss of the CUT over the designated frequency range and compare it to the maximum allowable loss for the cable. Since the cable loss is only a maximum amount of negative loss, the test displays only one parameter line, which represent the maximum loss at each of the corresponding frequency within the applicable frequency band.   The Insertion Loss Test takes a reading of the path loss with no CUT installed during the calibration and then takes an identical reading with the CUT installed and determines the loss associated with only the CUT.   The Insertion Loss Test Interface Panel is displayed in Figure 3–3.   The controls are the same as for the VSWR Test Interface Panel.
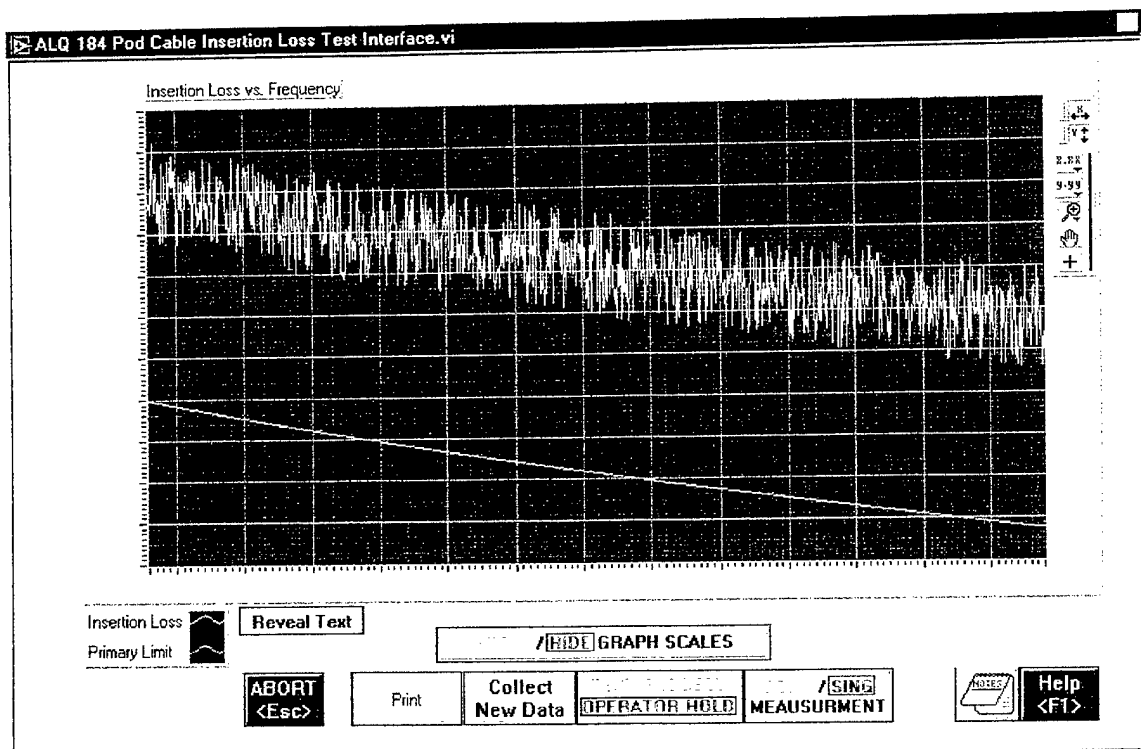
Figure 3-3   Insertion Loss Test Interface Panel

The ALQ-184 Cable Test Post Run Interface Panel represents a collection of all three test types displayed on a single interface panel. This allows the operator and opportunity to view entire cable performance from a single interface. The three graphs represent the VSWR, Phase, and Insertion Loss plot for the current CUT. Additionally, this panel enables some higher level functions to be performed. The first is the PRINT option. The PRINT option enables a selection interface that provides the operator printing options. The operator may print all plots, the default, or select to print only those plots of choice. This panel is also used to invoke the Phase Tracking Test, which is another display option included as part of the post-run activities. The remaining options presented on the post-run interface panel are standard controls and indicators that have been discussed previously. To activate the Phase Tracking Test, select the PHASE TRACKING option on the interface panel and the Phase Tracking Interface Panel will appear. This interface panel is discussed in the following paragraphs.
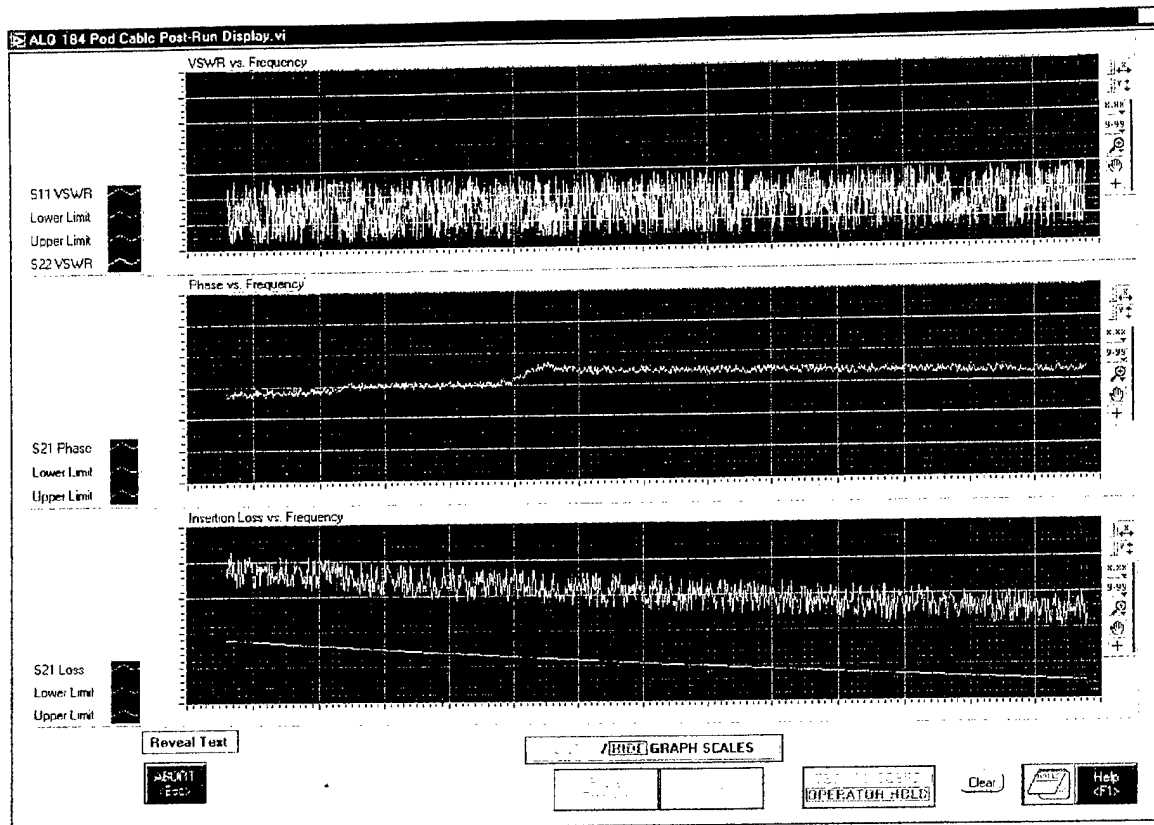
Figure 3-4 Post-Run Interface Panel

The Phase Tracking Test collects phase plots from the current group of cables. Each plot is assigned a plot number which corresponds to the order in which the plots where collected. Additionally, the maximum phase difference is displayed in the phase tracking plot at the top. The Phase Tracking Test compares the phase values of the individual cable plots at all frequencies across the desired frequency band and finds the single frequency point at which the greatest phase difference for all cable plots occurs. This is represented on the Phase Tracking Plot as a relative difference value. Since the only tolerance for the Phase Tracking Test is a not-to-exceed value, the plot displays a maximum difference limit line only. If the electrical or phase length of the cable is shorter than the desired length, this is interpreted as a negative phase value which is relatively more distant from the most positive or longest electrical length cable then all other positive length cables. Therefore, all tracking measurements are displayed as a relative phase difference, depicted as a positive value.
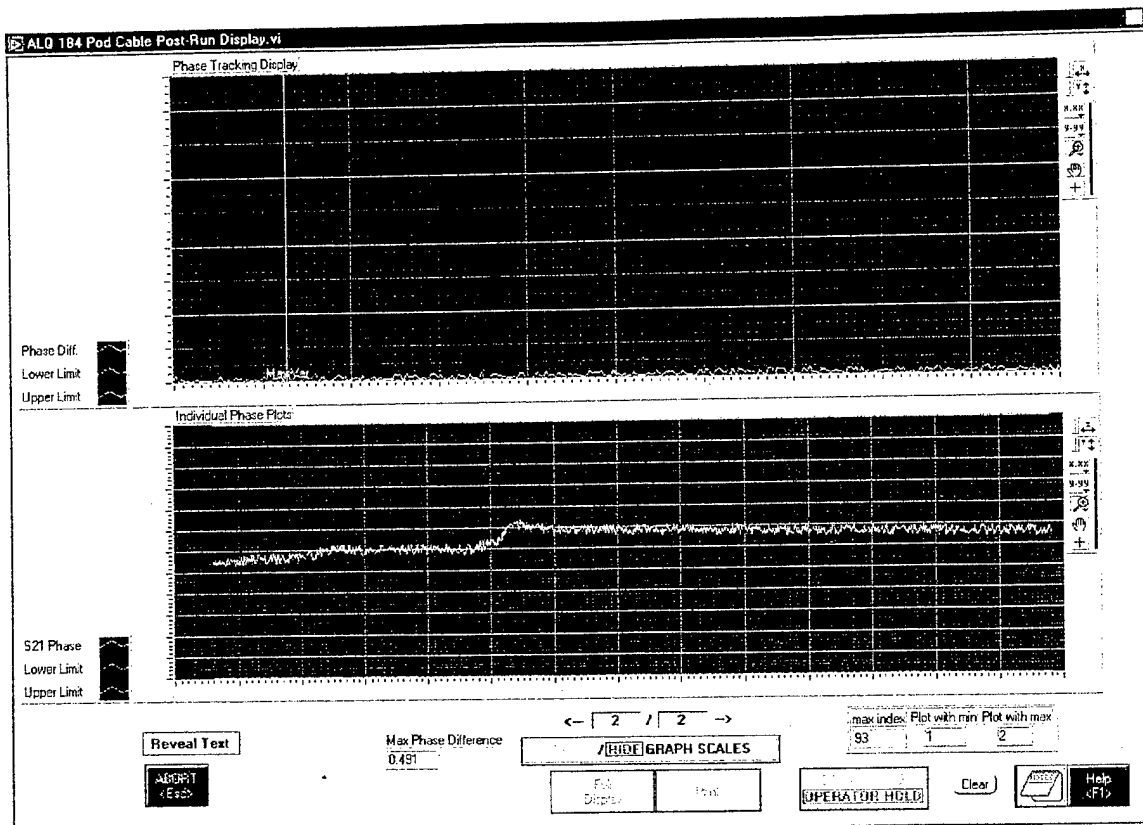
Figure 3-5 Phase Tracking Test Interface Panel

The Phase Tracking Test Interface Panel has numerous test specific user controls. The Max Phase Difference indicator displays the relative value representing the maximum phase difference of all cables current included in the Phase Tracking Test array. Above the SHOW/HIDE GRAPH SCALES option is plot selected/number of available plots indicator. The operator intuitively knows how many plots are stored within the current Phase Tracking Test array by the number of plots listed on the right. The number on the left indicates the currently displayed phase plot number. Remember this plot number is assigned by the order in which the phase plot data was collected. To sequence through the available phase plots and view the plot graphically, select the left arrow (←) to sequence down in the array and the right arrow (→) to sequence up. The on-panel textual display, blue text, lets the operator know when the first or last plot is reached within the Phase Tracking Test array. The box located above the TEST PROCEED/OPERATOR HOLD option contains information

pertinent to the Phase Tracking Test array. The Max Index indicator contains the number of indices within the current Phase Tracking Test array. The plot with MIN and plot with MAX values indicate the position within the array of the plots that have the greatest phase difference or those two plots currently defining the maximum and minimum for the Phase Tracking measurement. By viewing these two plots, the operator can verify the minimum and maximum phase values for the Phase Tracking Test. Finally, the CLEAR option is used to clear the plots currently stored within the Phase Tracking Test array. The operator should ensure all current phase tracking plots are saved or no longer required before selecting this option. Once this option is selected, all of the plot data for the applicable cable testing will be lost and is not recoverable.

The cable test data, including the phase tracking data, can be saved by using the applicable TEST EXECUTIVE AND RESULTS TOOL options prior to executing the CLEAR option from the Phase Tracking Test Interface Panel. To print the current cable's Test Sequence Report, select the Print option from the Test Executive Interface Panel before starting the next cable sequence. To print an entire set of cable test report, select the Results Tool option from the Test Executive Interface Panel. Then select the Print option from the Results Tool Interface Panel. To save the current Results File, select the Save option from the File window area on the Results Tool Interface Panel. Then save the file as whatever file name and file extension is desired.

To test additional cables after the cable test sequence is complete, select the TEST UUT option of the Test Executive Interface Panel. To ensure the cable is connected properly prior to executing the test, view the Vector Network Analyzer display and tighten, torque, or loosen the cable connects as required to achieve the flattest display results as near the center graticule as possible prior to executing the tests following the connection instructions. This process is repeated for each cable within the set.

To ensure the most accurate results, the input / output cables should be re-calibrated periodically. This can be accomplished between cable sets or about every two hours of test to ensure the best possible test results.

3.2 TPS File Development From System Specifications

The MiCATS™ editing environment is the heart of the RATEMC. It allows the developer to create operator instructions, device specific limit files, link these limits to generalized test programs, correlate the various files associated with the tests types, and perform validation of test parametric data using the graphical editing tools. This consists of a set of editing tools tied to the LabVIEW/ MiCATS™ Test Executive via the Test Sequence Editor. By selecting the EDIT option from the LabVIEW/MiCATS Test Executive Interface, the Test Sequence Editor is launched. Within the Test Sequence Editor is an option to edit the test VI. This option launches the various MiCATS™ Test Editors. Each test type has associated editors depending on the types of data required for the test type. For example, a Gain Test may require wide-band curve data to specify such requirements as drive level, upper gain limit, lower gain limit, operator instruction and various other test requirements. By selecting the EDIT TEST option from the LabVIEW/ MiCATS™ Test Sequence Editor, the edit options menu is presented as illustrated in Figure 3-6. By selecting the various options from the Test Edit Menu, the developer can open the test VI or the various editors associated with a particular test type.
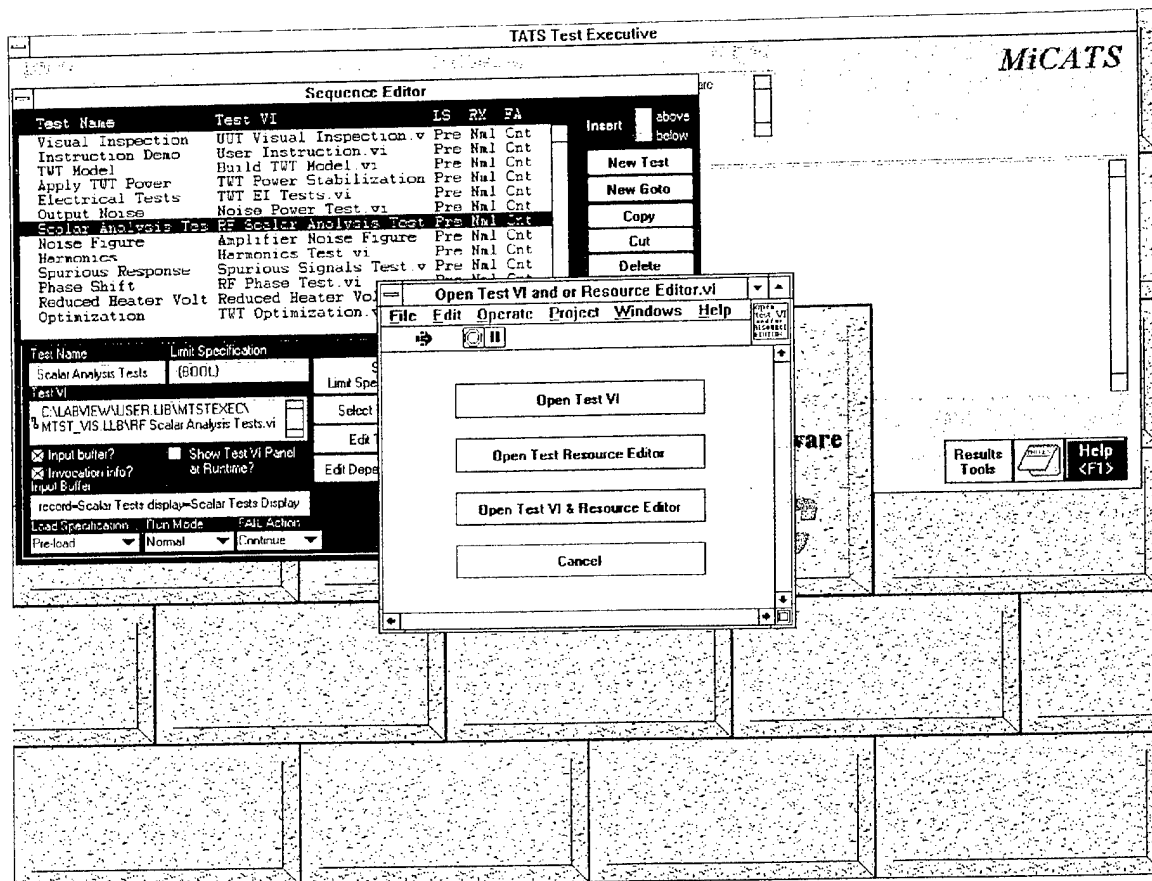
Figure 3-6   Test Sequence Editor's Test Edit Menu

After selecting the desired editing option, the individual editors will be opened allowing the software maintainer to create or edit test data. The test data editors consist of many editors that are linked to the various tests by the MiCATS™ Test Editor. This linking allows the individual tests to use numerous editors of varying types.

TATS-ML Editor.vi

TATSML Input LOAD SAVE CLEAR

sequence<Title: Chapter 1><NT>
<UHImg c:\labview\tats.lib\sequence\tatsdemo\plotb.bmp>
<OL><LI><AV>Apply </AV><ON>heat sink compound </ON>to the bottom surface of the TWT.
</OL>
<P><P>Use a uniform thin coat of heatsink compound. Failure to apply a uniform thin coat of heatsink compound may seriously degrade the heat transfer ability of the cold plate.
<Pg>
<ULImg c:\labview\tats.lib\sequence\tatsdemo\ploti.bmp>
<URImg c:\labview\tats.lib\sequence\tatsdemo\scalar.bmp>
<AV>Mount </AV>the <ON>TWT </ON>on the cold plate.
<OL><LI><AV>Place </AV>the <ON>TWT </ON>on the cold plate with the cathode end to the left.
<LI><AV>Clamp </AV>the <ON>TWT </ON>down using the foot clamps on the cold plate
</OL>
<Pg>

Markups   Start 2029   End 2037   Length 8

Search/Replace   Launch Viewer   Instruct

LOAD SAVE EDIT RESET

Spec File 8 C:\LABVIEW\TATS.LIB\SEQUENCE\TATSDEMO\INSTRUCT.SPX

Tag: NT   Name: Normal Text   User-specified Font

User-Specified
Font Name: Arial   Size 24

Strikeout? Italic? Underline? Outline? Shadow? Bold?
NO   NO   NO   NO   NO   NO

Added Text/vi   Sticky

Ext Action   Text   ---   Old Paragraph No Ch. FG ☒ BG T☐
Abort   List Control: Old Page
Chapters   Authoring vi
1

Figure 3-7 TML Editor

3.3 Developing A TPS Using The MiCATS™ Development Environment

First, the developer would use the Test Sequence Editor and the MiCATS™ Test Editor to define the tests needed within the device specific Test Sequence. Once the test sequence is developed, the required general test programs or VIs would be linked to the tests within the sequence using the Test Sequence Editor. An input buffer would be defined to indicate the location of the resource files to be used for each test within the sequence. The MiCATS™ Test Executive uses the input buffers to load the required resources during Test Executive initialization. Then, the individual test requirements identified by the user and the specific device specification would be developed using the applicable test editors.

Since the test may require the end user to perform certain set-up functions, the Textual Mark-up Language (TML) Editor would be used to develop standardized instruction sets for executing the test. Refer to Figure 3-7. The TML Editor uses standard textual input files, for example, Microsoft Word, to create test set up and execution instructions. These instructions are displayed in a standard format, using limited color coding to effectively convey operator interactions during test execution. Each unique test sequence has an associated instruction "book" file. Within the "book" files are chapters that relate to the individual tests within the sequence that use instructions. Within each chapter are pages that relate directly to instruction pages. These instruction pages contain the actual color-coded

instructions that the operator will view and pointers to any graphics that may be required to convey complex or highly interactive test set-ups. The graphics displays are presented as either upper half, upper right, or upper left bitmap images. The desired TML specification is loaded into the TML Editor from previously created files, allowing the developer to use unique mark-up specifications depending on user specific requirements. Once the TML files and the bitmap inks are embedded, the sequence specific TML file is saved in the desired sequence directory structure.

The remaining data within a Test Program Set (TPS) will consist of all the files required for the MiCATS™ test sequence to perform the desired test functions. Device specific specifications are used to create the various test limits files for the required tests. For example, a gain test would require input and output specification files to define the limits to which a generic Gain Test would perform within the required TPS. This can consist of many different requirements depending on the device to be tested, the device test requirements, and the user's test requirements. Therefore, a general description of gain test requirements are presented to provide an idea of the complexity of the interaction of the various components that are used to construct a gain test for a specific device. The Gain Test Editor would be launched from the Sequence Editor's Test Edit menu. Figure 3-8 shows a simplistic set of limit curves associated with a gain test. Each curve represents an input or output test requirement and the individual curves specify the test limits for each of these requirements. The ability to tie together all of these complex interactions into a uniform editing tool significantly simplifies the development process for a truly complex set of tests that have numerous dependencies and myriad data associated with them. The Gain Test Editor identifies for the developer all of the tests that must be performed, the interactions between these tests, and the ability to develop or edit the data associated with these requirements in a controlled environment. This makes the editor concept a very valuable tool for the developer and maintainer, but the editing environment does not end here.
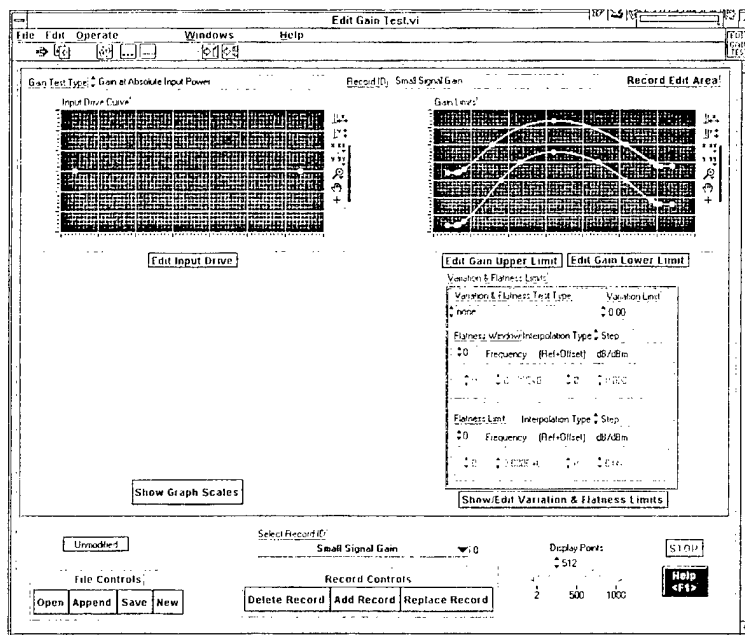
Figure 3-8 Gain Test Editor
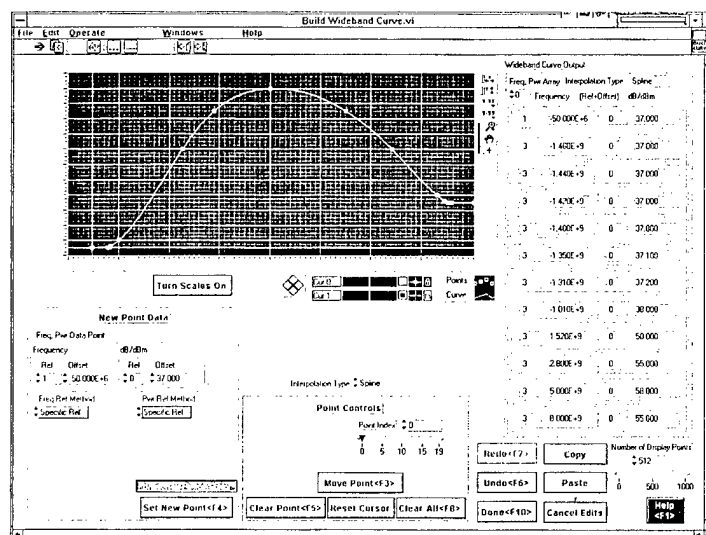
Figure 3-9 Wide Band Curve Editor

Robust correlation tools are integrated into the editing environment. The correlation tools automatically perform data integrity checks and look for the natural relationships that should be present in this complex series of tests. If items are reversed, missing, or

A-18

corrupted, the correlation tools will identify these errors to the developer. As each of the test specific requirements is entered, they use a standard graphical or data structure editor. The data structure can be used if numerical specification data is to be entered directly. However, if the requirements are flexible and a more intuitive method of creating the specification files are desired, we have included a "drag and drop" type of graphical editor, the Wide-Band Curve Editor in Figure 3-9. By minimizing the variation of editor types, we are able to lessen the software maintainer's burden while improving the editing environment. This minimizes the amount of software required to support development of individual test requirements while supporting maximum reuse of test development assets.

Finally, the instrumentation used to perform testing varies from user to user and test station to test station. Therefore, the MiCATS^{TM} software utilizes a Data Driven Driver that eliminates the need to develop driver software when the instrumentation changes. By managing the instrument specific data with the Data Driven Driver Resource Editor, the need to develop new driver software, typically encountered with other development strategies, is eliminated in the MiCATS^{TM} development environment. This enabled us to rapidly adapt to and use additional capabilities from the Vector Network Analyzer without the requirement to build additional driver software.

4. ALQ-184 CABLE TEST REPORTS

During execution of the ALQ-184 Cable Test software for WR-ALC/LNXEJ we collected cable test data and numerous cable sets containing 8 to 16 cables per set. The report data for each of these cables is included in Appendix 1. These reports are generated by the test sequence reporting method and the Result Tool method. Additionally, all cable test data has been saved and provided in electronic form with the ALQ-184 Cable Test software.

5. CONCLUSION

By employing a more flexible design concept, component-based algorithm development practices, and sound software development principles, a once insurmountable problem has been solved. TASC and their Air Force partners, WR-ALC/LN and the Wright Laboratories Hardware and Software Division, have solved the scaleable microwave test challenge and created RATEMC compatible applications using the development tools. The time and cost reductions associated with applications development utilizing scaleable MiCATS^{TM} software technology is very significant and sets the precedence for all future software development activities.

6. ALQ-184 Cable Test Results

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence	C:\ABVIEW\SEQUENCER\TTF\CATALOG\TCV\S.SEQ					
	Description:						
	Date:	7/1/91					
	Time:	7:23 AM					
	Operator:	mike					
	Operating Level:	Developer					
UUT Information							
	Part Number:	CalVer Allison					
	Vendor:	None					
	MSN:						
	Item Description:	Manual Pre-run Cal Validation					
	System:						
	AUC:						
	Serial Number:						
	ICN:						
	Type Maint:						
	SRD:						
	When Disc:						
	HOW MAL:						
	Tag No:						
	Removed From:						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WDC Enter		SKIP					
VWA OSL t2-Term Cal		SKIP					
VSWR Test		FAIL	FAIL				00:00:36.612
	S11 VSWR Maximum without limit	FAIL	1.00000	BOOL			
	S11 VSWR Maximum without limit frequency XFS	NONE	0.00000	LE	<1.00000		
	S22 VSWR Maximum without limit	FAIL	1.02000	LOG			
	S22 VSWR Maximum without limit frequency XFS	NONE	3.00000	LE	1.00000		
Phase Test		FAIL		LOG			
	Cal Validation Phase Minimum without limit	FAIL	0.00000	BOOL			
	Cal Validation Phase Minimum without limit frequency XFS	NONE	1.05000	GTLE	0.50000	<10.0000	
	Cal Validation Phase Maximum without limit	FAIL	0.50000	LOG			
	Cal Validation Phase Maximum without limit frequency XFS	NONE	10.50000	GTLE	0.50000	0.10000	
Insertion Loss Test		FAIL		LOG			
	Cal Validation Insertion Loss Maximum without limit	FAIL	0.00000	BOOL			
	Cal Validation Insertion Loss Minimum without limit frequency XFS	NONE	0.00000	GT	0.00000		00:00:21.121
Phase Test #2		SKIP		LOG			
EXECUTION TIME							
	Prerun Execution Time:						00:00:16
	Postrun Execution Time:						00:00:15
	Total Test Execution Time:						00:00:24
	Total UUT Execution Time:						00:00:40
	Overhead:	00:00:00.162	0.00010%				

A-23

PAGE 1 / 1

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	CTLASVTTWTSEQUENCETTWTCabilitCaitreq					
	Description:						
	Date:	7/1/98					
	Time:	6:22 AM					
	Operator:	mia					
	Operating Level	Developed					
UUT Information							
	Part Number:	1031372-8					
	Vendor:	limit					
	NSN:						
	Item Description:	Cable Assm UT					
	System:	ALQ 131					
	AUC:						
	Serial Number:	V231					
	ICN:						
	Type Maint:						
	SRD:						
	When Disc:						
	HOW MAL:						
	Jap No.:						
	Removed From:						
	Inspector Activity:						
	Conduct Code:						
	Discrepancy						
TEST RESULT		UUT FAILED	FAIL				
TEST RESULTS							
WEC Cabinet							
VHLOSE 12 Turn Cnt		SKIP					
VSWR Test		SKIP					
		PASS		1001			00.03.38.246
	S11 VSWR Maximum w/limit	PASS	1.320000	IE	1.400000		
	S11 VSWR Maximum w/limit frequency MHS	NONE	06.802441	100			
	S12 VSWR Maximum w/limit	PASS	1.210000	IE	1.210000		
	S12 VSWR Maximum w/limit frequency MHS	NONE	27.273100	LOG			
Phase Test		FAIL		8001			00.03.19.341
	1039372-1 Phase Minimum w/limit	PASS	5.711000	GELE	6.010000	6.725000	
	1039372-1 Phase Minimum w/limit frequency MHS	NONE	1.210001	LO3			
	1439372-1 Phase Maximum w/limit	FAIL	1.390000	GELE	6.010000	6.000000	
	1039372-1 Phase Maximum w/limit frequency MHS	NONE	86.000000	LOG			
Insertion Loss Test		FAIL		8001			00.00.26.073
	1108372-1 Insertion Loss Minimum w/limit	FAIL	1.770100	GE	1.010000		
	1108372-8 Insertion Loss Maximum w/limit frequency MHS	NONE	67.913242	LOG			
Phase Tracking		SKIP					
EXECUTION TIME							
	Pre Run Execution Time:						00.03.22
	Post Run Execution Time:						00.00.03.910
	Total Test Execution Time:						00.01.54
	Total UUT Execution Time:						00.05.20
	Overhead:	00.10.10.311	00.01.398K				

A-24

TATS-

Traveling Wave Tube Test Results

Test Name	Subject Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	CMADVIEWSEQUENCEINIFICABILITICable seq					
	Description:						
	Date:	1/1/00					
	Time:	9:31 AM					
	Operator:	mike					
	Operating Level:	developer					
UUT Information	Part Number:	1C91312-1					
	Vendor:	limu					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 114					
	WUC:						
	Serial Number	0231					
	LCN						
	Type Mat'l.						
	SRD:						
	Whse Disc:						
	How Mal.						
	Tag No.						
	Removed From.						
	Inspection Activity:						
	Condition Code						
	Discrepancy.	recalled S/n					
TEST RESULT		UUT FAILED	FAIL				
TEST RESULTS		SKIP					
MEC Edite		SKIP					
VNA OSL 12 Term Cal		PASS					
VSWR Test		PASS		200L			23:39:366
	511 VSWR Maximum cal limit	PASS	1.20000	LE	1.40000		
	511 VSWR Maximum without frequency VFS	NONE	98.09711	LOG			
	512 VSWR Minimum without limit	PASS	1.210000	LE	1.160000		
	512 VSWR Maximum without limit frequency VFS	NONE	17.212108	LOG			
Phase Test		FAIL		700L			00:00:31:116
	1019377-1 Phase Minimum without limit	FAIL	0.041000	GELE	6.000000	1.06:200	
	1C09372-1 Phase Minimum without limit frequency VFS	NONE	1.250000	LOG			
	1C06312-1 Phase Maximum without limit	FAIL	7.440000	GELE	6.000000	6.00000	
	1C1312-1 Phase Maximum without limit frequency VFS	NONE	98.600000	LOG			
Insertion Loss Test		FAIL		800L			03:00:33:30
	1C21312-1 Insertion Loss Maximum without limit	FAIL	-1.270000	GE	1.000000		
	1C09312-1 Insertion Loss Maximum without limit frequency VFS	NONE	61.871640	LOG			
Phase Testing		SKIP					
EXECUTION TIME							
	Fix Run Execution Time						00:00:05:105
	Post Run Execution Time:						10:00:03:117
	Total Test Execution Time:						00:00:16
	Total UUT Execution Time						00:00:15
	Overall	00:00:00:110	00:00:032				

Travelling Wave Tube Test Results

Test Name	Subject Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Testsequence	CHASY(CM)SEQUENCE(UFCabilitIC>H>1tt					
	Description:						
	Date:	7/4/11					
	Time:	13 AM					
	Operator:	ole					
	Catalog Level:	develops					
UUT Information							
	Part Number	1011372-1					
	Vendor	19055					
	WSN:						
	Item Description	Caps Assembly					
	System	AIQ111					
	WUC:						
	Serial Number	0015					
	JCN:						
	Type Maint:						
	SRD:						
	When Disc						
	HOW MAL						
	Lig No						
	Remover Fron:						
	Inspector Action:						
	Condition Code:						
	Discrepancy						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WHA Osc 12 Term Cal		SKIP					
VSWR Test		SKIP					
		PASS		0001			00 00 31 911
	S11 VSWR Maximum without limit	PASS	1 112700	LE	1 105500		
	S11 VSWR Maximum without limit frequency MFS	NONE	10 011465	100			
	S21 VSWR Maximum without limit	PASS	1 140022	LE	1 400000		
	S21 VSWR Maximum without limit frequency MFS	NONE	69 011711	100			
Phase Test		PASS		0001			00 00 19 916
	1011372-1 Phase Minimum without limit	PASS	1 780000	GELE	6 000000	6 00000	
	1011372-1 Phase Minimum without limit frequency MFS	NONE	13 315000	LOG			
	1011372-1 Phase Maximum without limit	PASS	0 162000	GELE	6 005000	6 00000	
Insertion Loss Test	1011372-1 Phase Maximum without limit frequency MFS	NONE	01 750055	LOG			1 00 22 010
	1011372-1 Insertion Loss Minimum without limit	PASS	1 210055	OE	1 210000		
	1011372-1 Insertion Loss Maxmum without limit frequency MFS	NONE	35 625000	LOG			
Phase Testing		SKIP					
EXECUTION TIME							
	First Run Execution Time:						00 00 05 111
	Next Run Execution Time:						10 00 01 191
	Total Test Execution Time:						10 01 11
	Total UUT Execution Time:						10 01 11
	Omitted	00 00 00 216	0 21109K				

PAGE
1 1

Traveling Wave Tube Test Results

Test Name	Subject Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT		C:\LABVIEW\SEQUENCE\STF\CableUUT\Cable.seq					
	Test Sequence:						
	Destination:						
	Date:	DATE					
	Time:	9:37 AM					
	Operator:	ni					
	Operating Level:	developer					
UUT Information							
	Part Number:	1030317-1					
	Vendor:	Isola					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 184					
	WUC:						
	Serial Number	0020					
	JCN:						
	Type Maint:						
	SRD:						
	Action Disc:						
	HOW MAL:						
	Ttl No:						
	Removed from:						
	Inspection Activity						
	Condition Code						
	Discrepancy						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WEC Editor		SKIP					
VNA OSL 12-18m Cal		SKIP					
VSWR Test		PASS		EQL			00 00 21 920
	S11 VSWR Maximum at limit	PASS	1.250000	LE	1.420000		
	S11 VSWR Maximum at limit frequency XF8	NONE	10.245644	LOG			
	S21 VSWR Maximum at limit	PASS	1.160400	LE	1.400000		
	S21 VSWR Maximum at limit frequency XF8	NONE	10.727847	LOG			
Phase Test		PASS		BOOL			00 00.10 066
	1030317-1 Phase Minimum at limit	PASS	0.046669	GTE	0.000009	0.05000	
	1030317-1 Phase Minimum at limit frequency XF8	NONE	1.250000	LOG			
	1030317-1 Phase Maximum at limit	PASS	1.420000	GTE	0.000000	6.000000	
	1030317-1 Phase Maximum at limit frequency XF8	NONE	11.423000	LOG			
Insertion Loss Test		PASS		BOOL			00 00 13 511
	1030317-1 Insertion Loss Minimum at limit	PASS	1.150000	GE	-1.150000		
	1030317-1 Insertion Loss Minimum at limit frequency XF8	NONE	11.120000	LOG			
Phase Tracking		SKIP					
EXECUTION TIME							
	Pre Run Execution Time:						00 00 05 435
	Post Run Execution Time:						00 00 05 912
	Total Test Execution Time:						00 01 19
	Total UUT Execution Time:						00 01 29
	Overhead:	00 00 00 207	0.231704K				

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	C:\ABVIEW\SEQUINCE\TTTC\TITC(CC)TE. seq					
	Deployed:						
	Date:	2/1/10					
	Time:	8:41 AM					
	Operator:	mhe					
	Operating Level:	testlevel					
UUT Information	Part Number:	103731-1					
	Version:	lines					
	MSN:						
	Item Description:	Cable Assembly					
	System:	AT0 106					
	HWC:						
	Serial Number:	9026					
	JCN:						
	Type Maint.:						
	SRD:						
	Main Cost:						
	HOW MAL:						
	Tag No.:						
	Removed From:						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
MWC Enter		SKIP					
VNA OSL 12 Term Cal		SKIP					
VSWR Test		PASS					00:00:36.722
	S11 VSWR Maximum without limit	PASS	1.760000	LT	1.860000		
	S11 VSWR Minimum with limit frequency XFS	NONE	99.793654	LOG			
	S22 VSWR Minimum without limit	PASS	1.760000	LT	1.400010		
	S22 VSWR Minimum with limit frequency XFS	NONE	100.000000	LOG			
Phase Test		PASS					00:00:19.416
	103731-1 Phase Minimum without limit	PASS	1.360000	GELE	6.000000	8.000000	
	103731-1 Phase Minimum with limit frequency XFS	NONE	6.310000	LOG			
	103731-1 Phase Maximum without limit	PASS	1.311000	GELE	6.000000	6.000000	
	103731-1 Phase Maximum with limit frequency XFS	NONE	36.000000	LOG			
Insertion Loss Test		PASS	1.160000	GE	1.260000		1:10:17.464
	103731-1 Insertion Loss Maximum without limit	PASS	95.190000	LOG			
	103731-1 Insertion Loss Minimum without limit frequency XFS	NONE					
Phase Testing		SKIP					
EXECUTION TIME							
	PreRun Execution Time:						00:00:05.101
	PostRun Execution Time:						00:00:03.313
	Total Test Execution Time:						00:01:24
	Total UUT Execution Time:						13:11:12
	Overhead:	00:00:00.119	0.210011%				

DATE ??

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test sequence:	C.\TWAB\IE\TMSEQUENCE\IIT(Cable\IIIT(Cable.seq					
	Description:						
	Date:	7/1/06					
	Time:	1:47 AM					
	Operator:	n/a					
	Operating test:	Envelope					
UUT Information	Part Number:	1031312-1					
	Vendor:	llnes					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 144					
	WUC:						
	Serial Number:	0011					
	ICN:						
	Type Maint:						
	SRD:						
	When Disc:						
	How Mal:						
	Tag No:						
	Removed From:						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
WRC Error		SKIP					
VWA OSL 12-Turn Ca		SKIP					
VSWR Test		PASS		BOOL			00 00 00 101
	S11 VSWR Maximum ntl limit	PASS	1.206100	LE	1.40000		
	S11 VSWR Maximum ntl limit frequency XFS	NONE	53.286452	LOG			
	S12 VSWR Maximum ntl limit	PASS	1.20000	LE	1.400000		
	S12 VSWR Maximum ntl limit frequency XFS	NONE	52.730651	LOG			00 00 10 120
Phase Test		PASS		BOOL			
	1031312-1 Phase Maximum ntl limit	PASS	0.660000	GELE	5.000240	6.000000	
	1031312-1 Phase Minimum ntl limit frequency XFS	NONE	1.250000	LOG			
	1031312-1 Phase Minimum ntl limit	PASS	2.130000	GELE	6.000000	11.000000	
	1(G8)312-1 Phase Minimum ntl limit frequency XFS	NONE	01.625000	LOG			
Insertion Loss Test		PASS		BOOL			00 00 21 400
	1031312-1 Insertion Loss Maximum ntl limit	PASS	0.540000	LE	0.670000		
	1031312-1 Insertion Loss Minimum ntl limit frequency XFS	NONE	6.590000	LOG			
Phase Testing		SKIP					
EXECUTION TIME	Prefix Execution Time:						00 00 01 111
	Post/Run Execution Time:						00 00 04 112
	Total Test Execution Time:						00 01 16
	Total UUT Execution Time:						00 01 29
	Overhead	00 00 00 307	0.355888X				

Test Name	Output Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
	Part Number:	10371721					
	Vendor:	Hays					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 114					
	WUC:						
	Serial Number:	DD1					
	JCN:						
	Type Maint:						
	S/RD:						
	When Disc:						
	HOW MAL:						
	Day Yr:						
	Removed Item:						
	Inspector, ActNr:						
	Condition Code:						
	Consumpncy						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS:							
VHA OSL 12 3um CU		SKIP					
VSWR Test		SKIP					
		PASS		BOOL			0:00 00 033
S11 VSWR Maximum with limit		PASS	1.270000	LE	1.450000		
S11 VSWR Maximum with limit frequency KFS		NONE	4701911	LOG			
S22 VSWR Maximum with limit		PASS	1.160000	LE	1.60000		
S22 VSWR Maximum with limit frequency KFS		NONE	1.749101	LOG			
Phase Test		PASS		BOOL			00 00 19 437
1031312-1 Phase Maximum with limit		NONE	1.310000	GELE	6.00000	6.00000	
1031312-1 Phase Minimum with limit frequency KFS		NONE	6.315000	LOG			
1031312-1 Phase Maximum with limit		NONE	0.100000	GELE	6.00000	6.051000	
1031312-1 Phase Minimum with limit frequency KFS		NONE	84.750000	LOG			
Insertion Loss Test		PASS		BOOL			00 00 21 910
1031312-1 Insertion Loss Minimum with limit		NONE	1.250000	GE	1.160000		
1031312-1 Insertion Loss Minimum with limit frequency KFS		SKIP	1.740000	LOG			
Phase Tracking							
EXECUTION TIME							
Pre-Run Execution time:							00 00 66 162
Post-Run Execution time:							00 00 01 215
Total Test Execution time:							00 01 17
Total UUT Execution time:							00 01 10
Overhead:		00 00 00 205	9.221491				

Reporting Mass ...

Test Description	Requirements		Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
UUT Identifier	Part Number						
	Vendor:						
	MSN	lines					
	Item Descriptor						
	System:	Cable Assembly					
	WUC:	AIQ 114					
	Serial Number:	J02A					
	JCN:						
	Type Maint:						
	SRD:						
	When Disc.						
	HOW MAL.						
	Top No.						
	Removed From:						
	Inspection Activity:						
	Confusion Code:						
	Contingency:						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
WBC Edited							
Y114 QSL 12 Turn Cal		SKIP					
VSWR Test		SKIP					
		PASS	BOOL			00 00 37 430
S11 VSWR Maximum without		PASS	LE	1.770000		
S11 VSWR Minimum without frequency MFS		NONE	LOG	10 117419		
S22 VSWR Maximum without		PASS	LE	1.166500	1.400000	
S22 VSWR Minimum and limit frequency MFS		NONE	LOG	102 065230		
Phase Test		PASS	BOOL			00 00 1 V
1C007I2-1 Phase Minimum without		PASS	GELE	0.020000	6 00000	
1C0932I-1 Phase Maximum without limit frequency MFS		NONE	LOG	1 250000		
1C093I2-1 Phase Minimum without		PASS	GELE	5.360000	6 000000	
1C1012I-1 Phase Maximum and limit frequency MFS		NONE	LOG	91 625000		
Insertion Loss Test		PASS	BOOL			00 00 13 471
1C1412I-1 Insertion Loss Maximum without		PASS	GE	4 190000	-0 160000	
1C141I2-1 Insertion Loss Minimum without limit frequency MFS		NONE	LOG	99 371000		
Phase Tracking		SKIP					
EXECUTION TIME							
TestRun Execution Time:							00 00 05 465
PostRun Execution Time:							00 00 03 953
Total Test Execution Time:							00 00 20
Total UUT Execution Time:							00 00 20
Overhead:		00 00 00 191	000016 X				

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test sequence:	C:\LABVIEW\SEQUENCE\twt\cabinittk8e.seq					
	Description:						
	Date:	11/6/90					
	Time:	8:50 AM					
	Operator:	mike					
	Operating Level:	developer					
UUT Information	Part Number:	1010372-1					
	Vendor:	linus					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 184					
	WUC:						
	Serial Number:	1024					
	JCN:						
	Type Maint:						
	JRD:						
	When Disc:						
	HOW MAL:						
	Tag No:						
	Removed From:						
	Inspection Activity:						
	Condition Code:						
	Outer group:						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WBC Editor		SKIP					
VNA OSL 12-Term Cor		SKIP					
VSWR Test		PASS					00:00:24.891
	S11 VSWR Maximum without limit	PASS	0.394000	LE	1.100000		
	S11 VSWR Maximum without limit frequency XFS	NONE	12.210611	LOG			
	S22 VSWR Maximum without limit	PASS	1.146000	LE	1.146000		
	S22 VSWR Maximum without limit frequency XFS	NONE	12.210611	LOG			
Phase Test		PASS		BOOL			00:00:18.581
	1051372-1 Phase Maximum without limit	PASS	-1.110135	GELE	5.000300	5.000300	
	1051372-1 Phase Minimum without limit frequency XFS	NONE	4.375000	LOG			
	1051372-1 Phase Maximum without limit	PASS	0.100000	GELE	6.000620	6.000002	
	1051372-1 Phase Maximum without limit frequency XFS	NONE	15.813000	LOG			
Insertion Loss Test		PASS	1.110000	BOOL			00:01:36.111
	1010372-1 Insertion Loss Minimum without limit	PASS	0.002144	GE	1.250000		
	1010372-1 Insertion Loss Minimum without limit frequency XFS	NONE		LOG			
Phase Tracking		SKIP					
EXECUTION TIME							
	PreRun Execution time:						00:00:06.200
	PostRun Execution time:						00:00:03.340
	Initial Test Execution time:						00:01:16
	Total UUT Execution time:						00:01:26
	Overhead:	00:00:09.216	0.333615%				

ID	Task Name	Jul '98	Aug '98	Sep '98	Oct '98	Nov '98	Dec '98	Jan '99	Feb '99	Mar '99	Apr '99	May '99	Jun '99	Jul '99
1	TASK 1 – Reconfigurable Hardware Design													
2	Identification of Candidate CCAs													
6	Requirements Definition													
10	Prototype Design													
16	TASK 2 – Prototype Hardware Development													
17	Acquire Material													
18	Prototype Breadboard Fabrication													
22	Initial Testing (TASC)													
27	Initial Testing (WR-ALC)													
30	Build & Test Flight Test CCAs													
38	TASK 3 – Support Process Assessment													
40	Develop Process Characterization													
46	Define Process Shortfalls													
47	Develop System Requirements Specification													
48	TASK 4 – Integration Testing													
49	Develop Integration Test Plan													
50	Integration Testing (WR-ALC)													
53	Integration Testing (Eglin AFB)													
57	Test Report													
61	TASK 5 – Project Management													
62	Program Plan													
63	Kick-off Meeting													
64	Status Report													
77	Project Review													

Project: WBRAP.mpp
Date: Thu 7/8/99

Task		Milestone	◆	Rolled Up Task	
Progress		Summary		Rolled Up Milestone ◇
				Rolled Up Progress

Page 1

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	CUADVIEWSEQUENCEUITCBTIAUDCADV.UIT					
	Customer:						
	Date:	7/1/08					
	Time:	8:54 AM					
	Operator:	nike					
	Operating Level:	developer					
UUT Information							
	Part Number:	1218322-1					
	Vendor:	Times					
	MSN:						
	Item Description	Cable Assembly					
	System:	ALQ 131					
	WUC:						
	Serial Number:	0021					
	JCN:						
	Type Maint.						
	GRO:						
	When Disc.						
	HOW MAL:						
	Inq Act:						
	Removed From						
	Inspection Action:						
	Condition Code:						
	Discrepancy	Re-use at end of cable at test-1					
TEST RESULT:		UUT FAILED	FAIL				
TEST RESULTS							
WRC Edit		SKIP					
VHA OIL IF Turn Cal		SKIP					
VSWR Test		PASS					
	511 VSWR Maximum without	PASS	1.300000	BOOL			00:01:31.16
	511 VSWR Maximum without frequency XFS	NONE	18.745511	LE	1.405200		
	521 VSWR Maximum without	PASS	1.114220	LOG			
	522 VSWR Minimum without frequency XFS	NONE	15.611515	LE	1.400000		
Phase Test		FAIL		LOG			
	1021312-1 Phase Minimum without	PASS	0.110000	BOOL			00:00:20.023
	1021312-1 Phase Minimum without frequency XF6	NONE	1.114200	GELE	6.010000	6.000000	
	1021312-1 Phase Maximum without limit	FAIL	1.320033	LOG			
	1021312-1 Phase Maximum without limit frequency XFS	NONE	16.621050	GELE	6.000042	6.000000	
Insertion Loss Test		FAIL		LOG			00:00:12.070
	1051312-1 Insertion Loss Minimum without	FAIL	1.360520	BOOL			
	1021312-1 Insertion Loss Minimum without frequency XFS	NONE	05.615000	GE	1.240000		
Phase Testing		SKIP		LOG			
EXECUTION TIME							
	Pre/Run Execution Time						00:00:35.551
	Post/Run Execution Time.						02:00:22.105
	Total Test Execution Time:						00:01:10
	Total UUT Execution Time:						00:01:10
	Overhead.	00:00:00.311	0.310630%				

TAT:

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test sequence:	CHASVIEWSFQUTHCTIFICCURIICCablevng					
	Description:						
	Date:	7/1/88					
	Time:	4:19 PM					
	Operator:	JONES					
	Operating level:	Mainua					
UUT Information	Part Number:	1019212-1					
	Vendor:	Iitel					
	MER						
	Item Description	Cable Assem'y					
	System:	ALO 104					
	WUC:						
	Serial Number	0011					
	JCN:						
	Type Maint.						
	SRD						
	When Disc.						
	HOW MAL						
	Tag No.						
	Removed Item						
	Inspection Activity						
	Coridin Code:						
	Discrepancy						
TEST RESULT		UUT FAILED	FAIL				
TEST RESULTS							
WBC Editor		SKIP					
VNA OSI 12-Term Ca'		SKIP					
VSWR Test		PASS		BOOL			
	S11 VSWR Maximum w/Limit	PASS	1.230000	LE	1.400000		00 00 34 244
	S11 VSWR Maximum w/Limit frequency XFR	NONE	12.723002	LOG			
	S21 VSWR Maximum w/Limit	PASS	1.134000	LE	1.40000		
	S21 VSWR Maximum w/Limit frequency XFR	NONE	16.111111	LOG			
Phase Test		FAIL		BOOL			00 00 54 321
	1019211-1 Phase Maximum w/Limit	PASS	0.810000	GE LE	6.000000	8.000002	
	1019212-1 Phase Maximum w/Limit frequency XFR	NONE	0.000000	LOG			
	1019212-1 Phase Maximum w/Limit	FAIL	0.540000	GE LE	6.010000	6.000000	
	1019212-1 Phase Maximum w/Limit frequency XFR	NONE	10.625000	LOG			
Insertion Loss Test		FAIL		BOOL			00 00 21 311
	1019312-4 Insertion Loss Maximum w/Limit	FAIL	1.320000	GE	1.010000		
	1019312-4 Insertion Loss Maximum w/Limit frequency XFR	NONE	67.150000	LOG			
Phase Linearity		SKIP					
EXECUTION TIME							
	Preflun Execution Time						00 00 04 064
	Postfun Execution Time						00 00 04 039
	Total Test Execution Time						00 01 52
	Total UUT Execution Time						00 07 01
	Overhead:	00 01 00 201	0 31441CX				

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	InitSequence:	SI1AVSWRS22VSWRCSI11CSI11CSI11CSI11CSI11Seq					
	Description:						
	Date:	08/08/					
	Time:	3:46 PM					
	Operator:	JONES					
	Operating Level:	Production					
UUT Information	Serial Number:	CalValidation					
	Vendor:	None					
	MSN:						
	Item Description:	Atomsean Per non cal validation					
	System						
	WUC						
	Serial Number:						
	ICN:						
	Type Maint						
	SRD						
	Wken Disc						
	HOW MAL						
	Seq No:						
	Reworked Item:						
	Inspection Activity:						
	Condition Code:						
	Discrepancy						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
WUC Editor		SKIP					
VNL OST I2-Turn Cal		SKIP					
VSWR Test		PASS					
	S11 VSWR Maximum without limit	PASS	1.610000	BOOL			00:00:11:601
	S11 VSWR Maximum without limit frequency XTS	PASS	17.444612	LE	1.100000		
	S22 VSWR Maximum without limit	NONE	1.010000	LOG			
	S22 VSWR Maximum without limit frequency XTS	NONE	86.444149	LE	1.100000		
Phase Test		PASS		LOG			
	Cal Validation Phase Maximum without limit	PASS	0.460000	BOOL			00:00:22:412
	Cal Validation Phase Maximum without limit frequency XTS	NONE	0.490000	GE LE	0.160000	2.160000	
	Cal Validation Phase Maximum without limit	PASS	0.332000	LOG			
	Cal Validation Phase Maximum without limit frequency XTS	NONE	13.590000	GE LE	-0.100150	0.101150	
Insertion Loss Test		PASS		LOG			00:00:20:425
	Cal Validation Insertion Loss Maximum without limit	PASS	0.052100	BOOL	0.210000		
	Cal Validation Insertion Loss Maximum without limit frequency XTS	NONE	1.118000	GE			
Phase Test		SKIP		LOG			
EXECUTION TIME							
	Pre Run Execution Time:						00:00:31
	Fault Run Execution Time:						00:00:01:560
	Total Test Execution Time:						00:01:21
	Total UUT Execution Time:						00:06:11
	Overhead:	00:00:00:212	2.63/14.1%				

PAGE 1 / 1

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	CNABVIEWSEQUENCEIIIICIRLIIIIRCoWIIeq					
	Duration:						
	Date:	2/11/10					
	Time:	3:35 PM					
	Operator:	JONES					
	Operating Level:						
UUT Information							
	Part Number:	10192711					
	Vendor:	Inner					
	NSN:						
	Item Description:	Cable Assembly					
	System:	AIQ 100					
	AUC:						
	Serial Number:	0020					
	JCN:						
	Type Maint:						
	SRD:						
	When Disc.:						
	HOW MAL:						
	Top Dis:						
	Remord Fion						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WBC Edder		SKIP					
VNA OSI Tt-Teen Cal		SKIP					
VSWR Test		PASS					
	J11 VSWR Minimum mt limit	PASS	1.725690	BOOL	1.400000		00 00 34 617
	J11 VSWR Minimum mt limit frequency XFS	NONE	00 788111	LE			
	J12 VSWR Maximum mt limit	PASS	1.300000	LE	1.100000		
	J12 VSWR Maximum mt limit frequency XFS	NONE	24 892411	LOG			
Phase Test		PASS		BOOL			00 21 16
	1031771-1 Phase Minimum mt limit	PASS	0.10000	GELE	6 00000	6 00000	
	1031772-1 Phase Minimum mt limit frequency XFS	NONE	1 21 6000	LOG			
	1031771-1 Phase Maximum mt limit	PASS	5 10000	GILE	6 00000	6 00000	
	1031771-1 Phase Maximum mt limit frequency XFS	NONE	04 62 000	LOG			
Insertion Loss Test		PASS		BOOL			00 00 12 111
	1031771-1 Insertion Loss Maximum mt limit	PASS	1 100000	GE	1 23 5000		
	1031772-1 Insertion Loss Minimum mt limit frequency XFS	NONE	04 290000	LOG			
Phase Tracking		SKIP					
EXECUTION TIME							
	PreRun Execution Time						00 00 06 30t
	PostRun Execution Time						00 00 00 153
	Total Test Execution Time						00 02 65
	Total UUT Execution Time						00 02 56
	Overhead		00 00 00 253				

A-37

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	CHABYEMSEQUEKCEIIICAIIIIICahaseg					
	Description						
	Date:	1/1/01					
	Time:	3:31 PM					
	Operator:	JONES					
	Operating Level	Manual					
UUT Information							
	Part Number	1031172-1					
	Vendor	First					
	NSN						
	Item Description:	CdVt Assembly					
	System:	NLQ 341					
	WUC:						
	Serial Number	0025					
	JCN:						
	Type Maint:						
	SRD:						
	When Disc:						
	HOW MAL:						
	Org No						
	Remarked From.						
	Maproduced Activity.						
	Condition Code:						
	Discrepancy:						
TEST RESULT:		UUT FAILED	FAIL				
TEST RESULTS							
MBC Collar		SKIP					
VNA OdL 12 Tech Cal		SKIP					
VSWR Test		PASS					00 00 00 212
	S11 VSWR Maximum wt limit	PASS	1.200000	BOOL	1.000000		
	S11 VSWR Maximum wt limit Frequency KFS	NONE	99.220058	LE			
	S12 VSWR Maximum wt limit	PASS	1.710000	LOG	1.400000		
	S12 VSWR Maximum wt limit Frequency KFS	NONE	95.711216	LE			
Phase Test		PASS		LOG			00 00 01 ??
	1010372-1 Phase Maximum wt limit	PASS	1.610000	GELE	6.000000	1.000000	
	1010372-1 Phase Minimum wt limit Frequency KFS	NONE	6.715000	LOG			
	1010372-1 Phase Maximum wt limit	PASS	0.160000	GELE	8.000000	6.000000	
	1010372-1 Phase Maximum wt limit Frequency KFS	NONE	14.675000	LOG			
Insertion Loss Test		FAIL		BOOL			00 00 43
	1013372-1 Insertion Loss Maximum wt limit	FAIL	1.570000	GE	-1.230000		
	1013372-1 Insertion Loss Minimum wt limit Frequency KFS	NONE	99.250002	LOG			
Phase Tracking		SKIP					
EXECUTION TIME							
	Pre Run Execution Time						00 00 01 024
	Post Run Execution Time						00 00 05 450
	Total Test Execution Time						00 00 20
	Total UUT Execution Time						00 02 49
	Overhead		00 00 00 360	0.150011%			

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT		CHARVIEW#SEQUENCE#:#C#1#1#C#1#1#q					
	Test Sequence:						
	Discipline:						
	Date:	7/11/30					
	Time:	1:01 PM					
	Operator:	JONES					
	Security Level:	Unlimited					
UUT Information							
	Part Number:	1075372-1					
	Vendor:	lines					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 155					
	AUC:						
	Serial Number:	0012					
	ICN:						
	Type Maint:						
	SRD:						
	When Due:						
	HOW MAL:						
	Tag No:						
	Required Fun.						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WBC Edits		SKIP					
VNA OSL 12 Term Cal		SKIP					
VSWR Test		PASS		BOOL			00 00 21 541
	S11 VSWR Maximum w/limit	PASS	1.270000	LE	1.150000		
	S11 VSWR Maximum w/limit frequency XFS	NONE	19.740310	LOG			
	S22 VSWR Maximum w/limit	PASS	1.326300	LE	1.400000		
	S22 VSWR Maximum w/limit frequency XFS	NONE	16.992401	LOG			
Phase Test		PASS		BOOL			00 00 10 283
	1C2B372-1 Phase Minimum w/limit	PASS	0.640500	GE LE	6.500000	6.500000	
	1C2B372-1 Phase Minimum w/limit frequency XFS	NONE	1.250000	LOG			
	1C2B372-1 Phase Maximum w/limit	PASS	2.730000	GE LE	6.010000	6.000000	
	1C2B372-1 Phase Maximum w/limit frequency XFS	NONE	14.240000	LOG			
Insertion Loss Test		PASS		BOOL			00 10 12 151
	1C2B372-1 Insertion Loss Minimum w/limit	PASS	4.190000	LE	1.710000		
	1C2B372-1 Insertion Loss Maximum w/limit frequency XFS	NONE	14.211000	LOG			
Phase Tracking		SKIP					
EXECUTION TIME							
	Perform Execution Time:						00 00 06 320
	Position Execution Time:						00 00 10 540
	Total Test Execution Time:						00 01:16
	Total UUT Execution Time:						00 01 34
	Overall:	02 01 00 317	0.402155X				

TX

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT		C U A B V E W S E Q U E N C U I C C U I I I E C U L I N Q					
	Test Sequence:						
	Description						
	Date:	7/1/11					
	Time:	3:15 PM					
	Operator	10N15					
	Operating Level	Intituoin					
UUT Intonation							
	Part Number:	1010372 8					
	Vendor	Innes					
	NSN:						
	Item Description.	Cable Assmbly					
	System:	AIQ 104					
	AUC:						
	Serial Number.	0026					
	ICN:						
	Type Maint:						
	SRO:						
	When Cert.						
	HOW MAL:						
	Top No:						
	Removed From.						
	Inspection Activity						
	Condition Code						
	Discrepancy:						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
WBC Edites		SKIP					
VNA OSL 12-18m Cal		SKIP					
VSWR Test		PASS					
	S11 VSWR Minimum wit limit	PASS	1.160000	LE	1.100000		26 00 24 723
	S11 VSWR Minimum at limit frequency XFS	NONE	14 320442	100			
	S22 VSWR Minimum wit limit	PASS	1.120042	LE	1.400000		
	S22 VSWR Minimum at limit frequency XFS	NONE	24.725311	LOG			
Phase Test		PASS		BOOL			
	1031311 1 Phase Minimum wit limit	PASS	1.01000	GELE	1.040000	6.00000)	00 00 19 417
	1031312 1 Phase Minimum wit limit frequency XFS	NONE	1.141000	100			
	1031313 1 Phase Maximun wit limit	PASS	5.310550	GELE	6.000550	6.40000	
	1031314 1 Phase Maximun wit limit frequency XFS	NONE	6.000050	100			
Insertion Loss Test		PASS		EOO1			03 00 28 917
	1010312 4 Insertion Loss Minimum wit limit	PASS	1.170520	GE	1.250000		
	1010314 4 Insertion Loss Maximun wit limit frequency XFS	NONE	24.315000	LOG			
Phase Testing		SKIP					
EXECUTION TIME							
	PreRun Execution Time:						00 00 01 121
	PostRun Execution Time.						00 00 04 533
	Total Test Execution Time:						00 01 21
	Total UUT Execution Time						00 01 31
	Overhead.	00.00 00 200	9.230156K				

PAGE 3 1 1

A-40

Travelling Wave Tube Test Results

Test Name	Subject Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test sequence:	C:\LABVIEW\SEQUENCE\TWC\BTWTIC\tbio.seq					
	Description:						
	Date:	7/11/11					
	Time:	10:17 PM					
	Operator:	JONES					
	Operating Level:	Technician					
UUT Information	Part Number:	1051172-1					
	Vendor:	litres					
	NSN:						
	Item Description:	Cable Assembly					
	System:	ALQ 184					
	WUC:						
	Serial Number:	024					
	ICN:						
	Type Maint.:						
	SRO:						
	When Disc.:						
	HOW MAL:						
	Log No.:						
	Removed From:						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT:		UUT PASSED	PASS				
TEST RESULTS							
WDC Filter		SKIP					
VNA OSL 12-Term Cal		SKIP					
VSWR Test		PASS					
	S11 VSWR Minimum at limit	PASS	1.315000	BOOL			00 01 34 356
	S11 VSWR Minimum at limit frequency XF8	NONE	01.715814	LE	1.10000		
	S12 VSWR Minimum at limit	PASS	1.310000	LE	1.40000		
	S12 VSWR Minimum at limit frequency XF8	NONE	06.714755	IGO			
Phase Test		PASS		BOOL			00 00 10 955
	1049171-1 Phase Minimum at limit	PASS	0 170010	GETE	6.00000	6.60000	
	1049172-1 Phase Minimum at limit frequency XF8	NONE	1 150000	LOG			
	1051172-1 Phase Minimum at limit	PASS	1 160000	GETE	6 00000	6 00550	
	1058172-1 Phase Minimum at limit frequency XF8	NONE	V1 653000	IG3			
Insertion Loss Test		PASS		BOOL			00 00 21 505
	1048172-1 Insertion Loss Minimum at limit	PASS	1 115000	GE	1.2100:0		
	1049172-1 Insertion Loss Minimum at limit frequency N15	NONE	01 250050	IOG			
Phase Testing		SKIP					
EXECUTION TIME							
	First Run Execution Time						00 02 14 410
	Post Run Execution Time						00 03 03 310
	Total Test Execution Time						00 03 16
	Total UUT Execution Time						00 03 55
	Overhead:	100 00 00 00	0 00551CX				

A-41

Traveling Wave Tube Test Results

Test Name	Subject Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	C:\LABVIEW\SEQUENCER\TTC\Cable\TTC\Cable.seq					
	Description:						
	Date:						
	Time:						
	Operator:						
	Operator Level:						
UUT Information							
	Part Number						
	Vendor						
	NSN:						
	Item Description	Cable Assembly					
	System						
	WUC:						
	Serial Number						
	UCN:						
	Type Maint:						
	SMD						
	When Done						
	HOW MAL						
	Log No						
	Demand Item:						
	Inspection Activity						
	Condition Code						
	Discrepancy:						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
WTC Cable							
VSWA Test							
Plant Test							
Insertion Loss Test							
Plant Testing							
EXECUTION TIME							

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	C.TLADVIEWSEQUENCE\ITWTCAT\ITWTCAT.seq					
	Description:						
	Date:	7/1/98					
	Time:	4:15 PM					
	Operator:	JONES					
	Operating Level:	Production					
UUT Information	Part Number:	ICQ6212-1					
	Vendor:	Times					
	MSN:						
	Item Description:	Cable Assembly					
	System:	A1Q 188					
	WUC:						
	Serial Number:	X22					
	JCN:						
	Type Maint:						
	SRD:						
	When Disc:						
	HOW MAL:						
	Trip No:						
	Removed From:						
	Inspection Activity:						
	Condition Code:						
	Discrepancy:						
TEST RESULT		UUT PASSED	PASS				
TEST RESULTS							
WBC Editor		SKIP					
VNA OSL 12 Term Cal		SKIP					
VSWR Test		PASS		BOOL			
	S11 VSWR Maximum at limit	PASS	1.220000	LE	1.400000		00.00.24.112
	S11 VSWR Maximum at limit Frequency MHz	NONE	91.911125	LOG			
	S21 VSWR Minimum at limit	PASS	1.300005	LE	1.400000		
	S22 VSWR Minimum at limit Amil Frequency MHz	NONE	98.245611	LOG			
Phase Test		PASS		BOOL			
	10593T2-1 Phase Minimum at limit	PASS	1.81000C	GELE	4.000000	6.000000	00.09.21
	10593T2-1 Phase Minimum at limit Frequency MHz	NONE	12.102300	LOG			
	10593T2-1 Phase Maximum at limit	FAIL	4.510010	GELE	6.000000	6.000000	
	10593T2-1 Phase Maximum at limit Frequency MHz	NONE	91.612000	LOG			
Insertion Loss Test		PASS		BOOL			
	1C08212-1 Insertion Loss Minimum at limit	PASS	1.116200	GE	1.230000		00.00.35.215
	1C08212-1 Insertion Loss Minimum at limit Frequency MHz	NONE	91.315000	LOG			
Phase Testing		SKIP					
EXECUTION TIME	In Run Execution Time:						00.00.47.371
	Post Run Execution Time:						00.00.04.148
	Total Test Execution Time:						00.00.57
	Total UUT Execution Time:						00.05.00
	Overhead:	00.00.00.721	0.013800				

Traveling Wave Tube Test Results

Test Name	Subtest Name	Result/Comments	Measured Value	Comparison	Lower Limit	Upper Limit	Execution Time
TEST REPORT	Test Sequence:	C WAVEWTSEQUENCE[WC CATW[WC(C bk seq					
	Description:						
	Date:	7/1/18					
	Time	124 PM					
	Operator:	JONES					
	Operating Limit:	Lehman					
UUT Information	Part Number:	1018372-1					
	Vendor:	Trost					
	U/S N:						
	Item Description:	Cable Assmbly					
	System:	A10 184					
	RUC						
	Serial Number:	1025					
	JCN:						
	Test Mcat:						
	SRD:						
	Anom Desc						
	WOW BAL						
	Try No:						
	Removed From:						
	Inspection Activity:						
	Creation Code:						
	Discrepancy	REPEAT AFTER CLEANING					
TEST RESULT		UUT PASSED	PASS	BOOL			
TEST RESULTS		SKIP					
WTC Editor		SKIP					
VNA OSL 12.1um Cal		PASS					00.00.23.210
VSWR Test	S11 VSWR Maximum without limit	PASS	1.190000	LE	1.101000		
	S11 VSWR Maximum without limit frequency MF3	NONE	12.44112	LOG			
	S22 VSWR Maximum without limit	PASS	1.230040	LE	1.400000		
	S22 VSWR Maximum without limit frequency MFS	NONE	56.897111	LOG			
Phase Test	1018372-1 Phase Minimum without limit	PASS	2.010003	GELE	6.000000	1.000000	02.312.0020
	1018372-1 Phase Minimum without limit frequency XFS	NONE	10.125000	LOG			
	1018372-1 Phase Maximum without limit	PASS	0.460000	GELE	6.000320	6.000000	
	1018372-1 Phase Maximum without limit frequency MFS	NONE	01.421010	GELE			
Insertion Loss Test	1018372-1 Insertion Loss Minimum without limit	PASS	1.150043	DE	1.250000		00.G132
	1018372-1 Insertion Loss Minimum without limit frequency XFS	NONE	04.150000	LOG			
Phase Testing		SKIP					
EXECUTION TIME	Pre Run Execution Time						00.00.05.101
	Test Run Execution Time						00.00.12.910
	Total Test Execution Time						03.G476
	Total UUT Execution Time						00.0146
	Overhead	00.00.08.210	0.101517X				

PAGE 1 / 1

LRU/SRU NOMENCLATURE	P/N	VENDOR	NSN	QPA	WUC	SMR CODE	MTBF/ MTBM	# OF SPARES PROVISION	2 VS. 3 LEVEL	WEIGHT	C INC
							/43.09				
APQ-180 Radar											
Transmitter, Radar	3173111-105	Hughes	5841-01-294-7946	1	72VAE		1521/229.6	0	3	188	
Circuit Card Assembly	5003252-10	*	5998-01-310-7478	1				?			
Transmitter Subassy	3249015-5	*	5841-01-107-2137	1				?			
Radar Modulator	3334045-10	*	5841-01-224-7835	1				?			
Radar Data Processor	5002060-10	*	5841-01-299-3515	1				?			
Radar Set Subassembly	5061302-15	*	5841-01-303-0403	1				?			
Detector Assembly	3334220-10	*	N/A	1		AFFDDT		?			
Power Supply	5001940	*	6130-01-226-1154	1				?			
Solenoid Power Supply	3334270-2	*	5841-01-407-5880	1				?			
Radar Rcvr/Exciter	3173025-115	*	5841-01-319-0646	1	72VBO		2487/250.65	0	3	63	
Filter Assembly	5002880	*	5841-61-224-7751	1				?			
RF Electronics	5002440-5	*	5841-01-328-8234	1				?			
IF Electronics	5002490	*	5841-01-226-1171	1				?			
Volt Reg./Fmr Calib	5002580	*	5841-01-226-5530	1				?			
Trans. Driver Gen.	5002610-10	*	5895-01-302-2076	1				?			
Trans. Driver Offset	5002660-1	*	5841-01-267-8662	1				?			
Local Oscil Gen.	5002710-1	*	5841-01-297-8078	1				?			
Ref Oscil Gen.	5002780-1	*	5841-01-267-7708	1				?			
Unit Control	5002860-1	*	5841-01-267-8737	1				?			
Intra-Radar Mux Bus	5002890	*	5841-01-231-9895	1				?			
Signal Processor	3173044-115	*	5841-01-284-3965	1	72VAA		600/416.56	0	3	60	
Display Interface	5042380-5	* ··	5999-01-281-8661	1				?			
Input Data Processor	5042370-5	*	5998-01-285-1282	1				?			
IRE/ASC	5042390	*	5841-01-227-4735	1				?			
Array Control Aux.	5042360-5	*	5999-01-279-7171	1				?			
Cent Proc Unit (CPU)	3562119-10	*	5998-01-299-8668	1				?			
Processor Pipeline	5042330-5	*	5999-01-279-3555	1				?			
Data Memory Struct	5042320-1	Hughes	5999-01-279-7172	1				?			
Inst Sequence Logic	5042310	*	5841-01-226-5538	1				?			
Global Bulk Mem Cont	5042350-3	*	5998-01-226-5535	1				?			
Global Bulk Memory	5042140	*	5998-01-296-1434	1				?			
Linear Regulator	5002942	*	6110-01-224-4330	1				?			
AC/DC Converter	5002902	*	6130-01-226-1155	1				?			

* ECP 2488 created 3173044-115
** ECP 2508 created 3173082-110
*** ECP 2325 created 3173111-110
(P) SOF Peculiar

A-45

Page 1 of 2

CUBIC CH/FT	UNIT COST	FCA/PCA DATE	DATA AVAIL	COST TO REPAIR	TPS COMPLEXITY	TPS DATE AVAIL	TPS DEV.	"I" LVL SE	"D" LVL SE	EQUIP. AVAIL	COMMENTS	F-15 P/N ECP/CCP
												3173111-110, 115
	$1,201,111	Feb-93	Jun-93		Very Complex	Mar-97	DME	EEETS	ARTS/MTTS		GFE	
	$55,487											
	$6,490											
	$83,099											
	$648,121											
	$300,014										APG-63	
	$84,550											
	$101,614										APG-63	
	$888,775	Feb-93	Jun-93		Complex	Mar-95	DME	EEETS	ARTS/MMTS	Jan-96	GFE	2249/M252
	$22,955											
	$166,680											
	$231,767											
	$153,779											
	$212,455											-5/-7
	$71,900											-10
	$215,304											
	$74,485											
	$61,005											
	$102,839											
	$695,312	Feb-93	Jun-93		Very Complex	Jan-96	DME	EEETS	ARTS/MMTS	Jan-96	GFE	3173044-100, 105, 107, 115
	$26,562											
	$65,574											
	$51,676											
	$62,553											
	$21,068											
	$53,575											
	$30,928											
	$67,732											
	$61,701											-4/-5/-10
	$71,079											
	$11,099											
	$30,349											

As of: 4/21/99 at 12:02 PM

LRU/SRU NOMENCLATURE	P/N	VENDOR	NSN	QPA	WUC	SMR CODE	MTBF/ MTBM	# OF SPARES PROVISION	2 VS. 3 LEVEL	WEIGHT	
Analog/Digital Convert.	3173037-100	•	5895-01-310-0160	1	72VAF	PAODDT	195.48	5	3	70	1F
Chassis	5091575	•									
High Prf	5043220-15	•	5998-01-299-8047	1		PAFDD		?			
(P) (A2) Gain Cont Amp	5091580-5	•	5998-01-328-4716	1		PAFLDT		2		48	2
11 Bit A/D	5039960-7	•	5998-01-356-4392	1		PAFDD		?			
VFO	5085490	•	5998-01-285-7495	1		PAFDD		?			
(P) (A5) 6 Bit A/D-Interferface	5091590-10	•	5998-01-328-4725	1		PAFLDT		2		48	2
(P) (A6) Priority Buffer	5091600	•	5998-01-328-4728	1		PAFDDT		2		48	2
I/O Log/Tim Cont.	5065480	•	5998-01-268-6188	1		PAFDD		?			
Dagc/Micro Processor (A8)	5065420-65	•	5998-01-310-2196	1		PAFDAT		3		48	2
Linear Regulator	5002300-5	•	5841-01-311-2851	1		PAFDD		?			
Power Supply	5002210-15	•	6130-01-282-8769	1		PAFDD		?			
Cable Assy	5091577	•		1		PAFFFP		?			
Cable Assy	5091578	•		1		PAFFFP		?			
Data Processor	3173082-105	•	5841-01-290-5864	1	72VAB		718/453.25	0	3	53	
Inter Nav Set (INS)	3562124-5	•	5998-01-279-6050	1				?			
AIO/DO	3562114-10	•	5998-01-279-6048	1				?			
RSP Wall Clock	3562120-15	•	5998-01-293-1546	1				?			
Can Comp/Dig Input	3562121-15	•	5998-01-318-0303	1				?			
I/O Bus Controller	3562122-10	•	5999-01-268-6186	1				?			
Cent Proc Unit (CPU)	3562119-10	•	5998-01-299-8666	1				?			
Memory Controller	3562191	•	5998-01-292-2801	1				?			
Working Memory	3562113-15	•	5998-01-312-6075	1		PAFDDT		?			
Firm Memory	3562185	•	5998-01-297-7764	1		PAFDDT		?			
Linear Regulator	5002230	•	5999-01-217-6746	1		PADDDT		?			
Antenna	3173032-100	Hughes	5985-01-309-4085	1	72VAC	PAODDT	147.87	14	3	131	
Antenna Assy	50855566	•		1		PAFDDT		1			
Disk Brake Assy	6239153	•		1		PAFDDT		2			
Valve Assy Hyd	6239152	•		1		PAFFFP		?			
Gimbal Assy	6239140	•		1		PADDDT		2			
Inst. Assy Read	6239209	•		1		PAFDDT		1			
Inst. Assy REA	6239210	•		1		PAFDDT		1			
Hyd Manifold	6239201	•		1		PADDDT		1			
Cable Wrap	6239187	•		1		PAFFFP		1			
Wiring Harness	6239192	•		1		PAFDDT		3			
LV Power Supply	3173615-100	•	6130-01-309-3092	1	72VAH	PAODDT	5374/1198.31	6	3	42	
(A1) Circuit Card Assembly	3569820	•	5998-01-158-5207	1		PAFLD		?			
(P) (A2) LV Dir Current	5085628	•	5998-01-328-8779	1		PAFLDT		2			
(A3) Voltage Regulator	3589970-20	•	6110-01-123-0868	1		PAFLD		?			
(P) (A4) Control Amp	6237440	•	5998-01-329-0760	1		PAFLDT		2			
(P) (A5) A/E Elect. Control	6237450	•	5998-01-328-8820	1		PAFLDT		2			
(P) (A6) LV Power Sub Ass	5091590-10	•	6130-01-328-4680	1		PAFDDT		2			
Chassis	5058625	•		1		XB		?			
Bonded Assembly	3556300	•	5841-01-122-6684	1		XB		?			
Indicator Assy Faul	5085685	•		1		PAFFFP		?			

JPPORT DATA

UBIC CH/FT	UNIT COST	FCA/PCA DATE	DATA AVAIL	COST TO REPAIR	TPS COMPLEXITY	TPS DATE AVAIL	TPS DEV.	"I" LVL SE	"D" LVL SE	EQUIP. AVAIL	COMMENTS	F-15 P/N ECP/CCP
x26x18	$1,079,459	Feb-93	Jun-93		Average	Feb-95	DME	EEETS	RMTS	Jan-96		2192/M228
									TBD			
									ARTS/MMTS			-5/10
	$51,221											
									TBD			
x32x8	$71,600								ARTS/MMTS			-3/-5/-7
	$68,000								ARTS/MMTS			-5/-10/-15
	$72,150								TBD			/278
x32x8	$217,825								TBD			
x32x8	$63,889								ARTS/MMTS			
	$62,278											
x32x8	$97,815											
	$2,921											-10/-12
	$107,990											
												3173082-110, 115
	$440,373	Feb-93	Jun-93		Complex	Jan-95	DME	EEETS	ARTS/MMTS	Jan-96	GFE	
	$40,389								ARTS/MMTS			
	$29,229								ARTS/MMTS			-7/-10
	$35,877								ARTS/MMTS			-5/-6/-10
	$54,820								ARTS/MMTS			-5/-7/-20
	$28,996								ARTS/MMTS			
	$21,068								ARTS/MMTS			
	$21,740								ARTS/MMTS			-5/-10
	$44,388								ARTS/MMTS			
	$40,144								ARTS/MMTS			
	$20,838											
	$1,858,082	Feb-93	Jun-93		Very Complex	Mar-97	DME					
26x18	$428,016	Feb-93	Jun-93		Average	Apr-95	DME	EETS	AADTS			
	$29,450								ARTS/MMTS			
	$38,553								TBD			
	$20,443								ARTS/MMTS			
	$79,310								TBD			
	$79,310								TBD			
	$11,127								TBD			Throw away
									TBD			
	$5,617								TBD			

A-48